Appendix G: References about Refugee Children

Refugee Children and Lead Screening Recommendations

Refugees are a special group of immigrants who are admitted into the United States because of persecution or a well-founded fear of persecution on account of race, religion, nationality, membership in a particular social group, or political opinion. These individuals enter the United States legally as a refugee pursuant to Section 207 of the Immigration and Naturalization Act. For the most part, refugees cannot return home because of the danger they would face upon returning. There are a few additional immigration statuses that fall under the refugee umbrella: (1) asylees, (2) Cuban/Haitian entrants and humanitarian parolees, (3) Amerasians, (4) certified international victims of a severe form of human trafficking, and (5) Iraqi and Afghan Special Immigrant Visa holders.

Since refugee children (1) often enter into the country after the universal blood lead testing ages of 12 and 24 months, (2) are likely to never have received prior testing, and (3) are at above-average risk for lead poisoning, CDC has special post-arrival recommendations for them. The following section includes some resources for those health care providers serving refugee children. The below links can also be accessed for more information.

Lead Screening Guidelines for Refugee Children

http://www.cdc.gov/immigrantrefugeehealth/guidelines/lead-guidelines.html

CDC's Lead Poisoning Prevention in Newly Arrived Refugee Children: Toolkit

http://www.cdc.gov/nceh/lead/Publications/RefugeeToolKit/Refugee_Tool_Kit.htm

CDC Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children

http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/pdfs/cdcrecommendations.pdf

Q&A: CDC's Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children

http://www.cdc.gov/nceh/lead/Publications/RefugeeToolKit/pdfs/q-and-a.pdf

LEAD SCREENING DURING THE DOMESTIC MEDICAL EXAMINATION FOR NEWLY ARRIVED REFUGEES

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

Division of Global Migration and Quarantine

September 18, 2013

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

Table of Contents

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.

References

1. Centers for Disease Control and Prevention (CDC). Blood lead levels--United States, 1999-2002. *MMWR Morb Mortal Wkly Rep*. 2005;54:513-516.

2. Minnesota's Lead Poisoning Prevention Programs. Report to the Legislature. February 2007. Environmental Health Division. Minnesota Department of Health. Available at: http://www.leg.state.mn.us/docs/2007/mandated/070319.pdf. Accessed May 13, 2013.

3. Geltman PL, Brown MJ, Cochran J. Lead poisoning among refugee children resettled in Massachusetts, 1995 to 1999. *Pediatrics*. 2001;108:158-162.

4. Mitchell T, Jentes E, Ortega L, et al. Lead poisoning in United States-bound refugee children: Thailand-Burma border, 2009. *Pediatrics.* 2012;129(2):e392-399.

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

6. Wright RO, Tsaih SW, Schwartz J, Wright RJ, Hu H. Association between iron deficiency and blood lead level in a longitudinal analysis of children followed in an urban primary care clinic. *J Pediatr*. 2003;142:9-14.

7. Laraque D, Trasande L. Lead poisoning: successes and 21st century challenges. *Pediatr Rev*. 2005;26:435-443.

8. Canfield RL, Henderson CR Jr, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 microg per deciliter. *N Engl J Med*. 2003;348:1517-1526.

9. American Academy of Pediatrics. Lead. In: Etzel R, ed. *Pediatric Environmental Health.* Vol 1. 2nd ed. United States of America: American Academy of Pediatrics; 2003:249.

10. Centers for Disease Control and Prevention (CDC). Fatal pediatric lead poisoning--New Hampshire, 2000. *MMWR Morb Mortal Wkly Rep*. 2001;50:457-459.

11. Centers for Disease Control and Prevention. Managing elevated blood lead levels among children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Accessed July 23, 2013.

12. Centers for Disease Control and Prevention (CDC). Lead poisoning associated with use of litargirio--Rhode Island, 2003. *MMWR Morb Mortal Wkly Rep*. 2005;54:227-229.

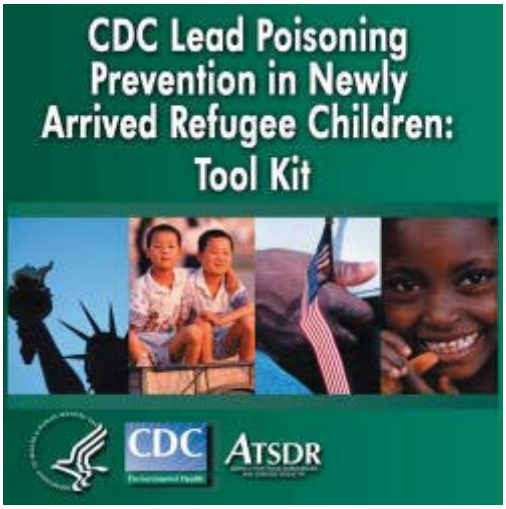
13. Centers for Disease Control and Prevention. Screening young children for lead poisoning: guidance for state and local health officials. . Accessed August 5, 2013, 2013.

14. Centers for Disease Control and Prevention (CDC). Lead poisoning associated with imported candy and powdered food coloring--California and Michigan. *MMWR Morb Mortal Wkly Rep*. 1998;47:1041-1043.

15. Centers for Disease Control and Prevention (CDC). Infant lead poisoning associated with use of Tiro, an eye cosmetic from Nigeria—Boston, Massachusetts, 2011. *MMWR Morb Mortal Wkly Rep*. 2012;61(30):574-576.

Lead Poisoning Prevention in Newly Arrived Refugee Children: Tool Kit

http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/refugee_tool_kit.htm



Click to download complete tool kit[ZIP - 28.2 MB]
(http://www.cdc.gov/nceh/lead/Publications/RefugeeToolKit/toolkit.zip)

Introduction to the Tool Kit

The Centers for Disease Control and Prevention's (CDC) Lead Poisoning Prevention Program in conjunction with the Office of Refugee Resettlement developed the Lead Poisoning Prevention in Newly Arrived Refugee Children tool kit in response to the increasing number of refugee children entering in the United States and subsequently developing elevated blood lead levels.
CD-ROMs of the tool kit are available by calling 1-800-CDC-INFO.

Background

On April 21, 2000, a 2-year-old Sudanese refugee girl became the first child in the United States known to have died from lead poisoning in 10 years. Her exposure occurred in the United States and was caused by lead paint in the home.

Beginning in May 2004, after the resettlement of 242 refugee children, predominately from Africa, it was discovered that a significant number of the children age range from 6 months to 15 years developed elevated blood lead levels after their arrival to the United States. Most of the children were resettled to a state that had a policy to screen refugee children for lead during their initial health examination. The first blood lead screening was done within 90 days of the children's arrival; the

second screening was done 3 to 6 months after their placement in permanent residence. Most of the children had initial capillary blood lead levels <10 micrograms per deciliter, which supports the hypothesis that exposure occurred after arrival to the United States.

Environmental investigations revealed moderate lead hazards in the residence and some contamination in soil in play areas frequented by the children. The children showed evidence of extreme chronic malnutrition and other moderate to severe health conditions.

Lead poisoning continues to be a reoccurring problem for refugee children resettled in the United States. Although little is known about lead exposure in their country of origin, data collected and research supports that most of the children are poisoned after their resettlement to the United States.

Recommendations

Primary Prevention of Elevated Blood Lead Levels

Ideally all children would live in lead-safe housing, especially those whose nutritional status and lack of knowledge about the dangers of lead place them at great risk for lead poisoning. However, we recommend the following to reduce the risk of lead exposure in refugee children:

Identification of Children with Elevated Blood Lead Levels

1. Blood lead level testing of all refugee children 6 months to 16 years old at entry to the United States.
2. Repeat blood lead level testing of all refugee children 6 months to 6 years old 3 to 6 months after refugee children are placed in permanent residences and older children, if warranted, regardless of initial test results.

Early Postarrival Evaluation and Therapy

1. Upon U.S. arrival, all refugee children should have nutritional evaluations performed, and should be provided with appropriate nutritional and vitamin supplements as indicated.
2. Evaluate the value of iron supplementation among refugee children.

Health Education/Outreach

1. CDC and its state and local partners should develop health education and outreach activities that are culturally appropriate and sensitive to the target population.

2. CDC and its state and local partners should develop training and education modules for health care providers, refugee and resettlement case workers, and partner agencies (e.g., WIC) on the following:
    - Effects of lead poisoning among children.
    - Lead sources in children's environments and ways to reduce the risk of exposure.
    - Nutritional and developmental interventions that can mitigate the effects of lead exposure.
    - Ways to provide comprehensive services to children with elevated blood lead levels.

Further details are available at: CDC Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children[PDF – 454 KB] (http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/pdfs/cdcrecommendations.pdf)

Contents of the Tool Kit

The tool kit is divided into three sections.

1. **Refugee Resettlement Worker Module**
   Direct download: PowerPoint Presentation[PPT - 11.6 MB] (http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/powerpoint_files/refugeechildren.ppt) and Presentation Notes[DOC - 82 KB] (http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/word_documents/refugee_resettlement_worker_module_text.doc)
   Purpose: This self-guided module provides information about the importance of identifying and determining possible lead hazards in the homes of newly arrived refugee children, assuring blood lead medical services to these children, and educating the refugee population on lead poisoning prevention.
   Intended Audience: This module was developed for refugee coordinators, refugee health coordinators, state and local health departments, and additional organizations involved with the well-being and resettlement of refugees.
2. **Medical Provider Module**
   Direct download: PowerPoint Presentation[PPT - 14.1 MB] (http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/powerpoint_files/medicalservice.ppt) and Presentation Notes[DOC - 66 KB] (http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/word_documents/medical_provider_module_text.doc)

Purpose: This self-guided module provides information about CDC's recommendation for identifying children with elevated blood lead levels and early post-arrival medical evaluation and therapy.

Intended Audience: This module was developed for those involved with direct medical services to refugees.

3. **Resources(http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/rtk_resources.htm)**

   Purpose: This section includes resources for refugee resettlement workers and medical providers such as frequently asked questions about CDC's recommendations for lead poisoning prevention in newly arrived refugee children, fact sheets, training materials, links to childhood lead poisoning prevention organizations, and more.

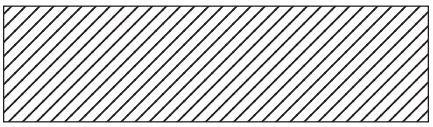
   Intended Audience: These resources were collected to assist anyone interested in learning more about the issue of lead poisoning among newly arrived refugee children.

Evaluation

We would like to receive feedback from you on the usefulness of this tool kit as it applies to your job. We would also like to know what we can do to enhance this product and that of future tool kits. Please email leadinfo@cdc.gov and let us know.

Contact Us:

- Centers for Disease Control and Prevention
  - 1600 Clifton Rd, Atlanta, GA 30333
  - 800-CDC-INFO (800-232-4636), TTY: 888-232-6348
  - Email CDC-INFO



CAPILLARY BLOOD SAMPLING PROTOCOL

The high potential for lead contamination of specimens during collection is well known,[1-3] and some have suggested special steps to minimize the likelihood of contamination. These include thorough scrubbing of the hand and finger with soap and then alcohol,[4-5] using dilute nitric acid [6-7] or using silicone or a similar barrier spray.[3, 8-10] In three recent CDC-funded studies, results showed that using a silicone barrier spray did not reduce contamination errors in capillary blood collection protocols.[11-13] However, results of these studies also showed that capillary blood collection by fingerstick had very low (<10%) contamination error rates.

Various types of plastic microcollection containers (150 - 250 µL) are currently available and being used successfully to collect capillary blood from young children. Plastic containers are better than glass microhematocrit tubes, because the latter have been known to break, causing injury to laboratory personnel. The following procedure for collecting capillary blood specimens by fingerstick is recommended.

A. Materials Needed

- Soap
- Alcohol swabs. If a surgical or other disinfectant soap is used, alcohol swabs can be eliminated.
- Sterile cotton balls or gauze pads
- Examination gloves
- Lancets. The type of lance used is largely a matter of personal preference as long as sterility is guaranteed.
- Microcollection containers. The laboratory should be consulted beforehand about the type of device it will accept. Some laboratories will provide "lead-free" tubes for blood lead screening purposes.
- Adhesive bandages.
- Trash bags suitable for medical waste and containers for sharps. Bags containing medical waste should be clearly identified as such.
- Storage or mailing containers if needed. If specimens require shipment, follow the U.S. P.S. or other appropriate regulations for the transport of body fluids.
- Laboratory coat and protective glasses.

Materials used in the collection procedure that could contaminate the specimen (for example, blood containers, alcohol swabs, and barrier sprays) must be lead-free. **Before selecting equipment for use in blood collection, consult the laboratory about its requirements.** In many cases, the laboratory will recommend or supply suitable collection equipment and may precheck the equipment for lead contamination. Some instrument manufacturers also supply collection materials that are pretested for lead content.

B. Preparing for Blood Collection

All personnel who collect specimens should be well trained in and thoroughly familiar with the collection procedure and the use of universal precautions against the transmission of blood-borne pathogens. The skill of the collector will greatly influence the specimen quality. All

equipment should be within easy reach. The environment should be clean, secure, and as nonthreatening to the child as possible. Any necessary consent should be obtained before specimen collection begins, and the procedure should be explained to the child and the parent or guardian. Used materials should be immediately discarded into appropriate medical waste containers

C. Preparing the Finger for Puncture

NOTE: Puncturing the fingers of infants younger than 1 year of age is not recommended. Puncturing of the heel or toe may be more suitable for these children.[14]

Collection personnel should wear examination gloves whenever the potential for contact with blood exists. If the gloves are coated with powder, the powder should be rinsed off with tap water.

The child's hands should be thoroughly washed with soap and then dried with a clean, low-lint towel. Plain, unprinted, nonrecycled towels are best.[15] If desired, collection personnel can use a brush to clean the finger; brushing the finger during washing can increase blood circulation in the finger.[9] Once washed, the clean finger must not be allowed to come into contact with any surface, including the child's other fingers.

The finger to be punctured (often the middle finger) must be free of any visible infection or wound; it should be massaged to increase circulation before being punctured with the lancet. This massage can be done during or after washing.[9, 10]

Steps for Preparing the Child's Finger

1. Select examination gloves. If necessary, rinse them to remove powder.

2. Wash the child's hands thoroughly with soap and water, and then dry them with an appropriate towel.

3. Grasp the finger that has been selected for puncture between your thumb and index finger with the palm of the child's hand facing up.

4. If not done during washing (see preceding notes), massage the fleshy portion of the finger gently.

5. Clean the ball or pad of the finger to be punctured with the alcohol swab. Dry the fingertip using the sterile gauze or cotton ball.

Puncturing the Finger

After the finger is prepared, the puncture and subsequent steps of forming a drop of blood and filling the collection container should be performed quickly and efficiently, since any delay can make collection more difficult (for example, the blood may clot or the child may resist). Several types of lancets are suitable for puncturing children's fingers. Lancets range from small manual blades and spring-loaded assemblies to disposable self-contained units. The latter are particularly attractive since the blade is automatically retracted into the holder after use, thus reducing the risk for self injury. Many devices are available with a selection of puncture depths suitable for small children or adults. Regardless of the type of lancet used, make the puncture swiftly, cleanly, and deep enough to allow for adequate blood flow.

The site of the puncture should be slightly lateral to the ball of the finger. This region is generally less calloused, which makes puncturing easier and possibly less painful.[9] The first drop of blood contains tissue fluids that will produce inaccurate results; it should be removed with a sterile gauze or cotton ball.[9,10]

A barrier material, such as silicone that is sprayed on the finger at this point in the process, will help a distinct "bead" of blood to form and may aid in blood collection. Blood that runs down the finger or around the fingernail is no longer suitable. Blood flows better when the punctured finger is kept lower than the level of the heart. Inadequate blood flow can be improved by gently massaging the proximal portion of the finger in a distal direction, then pressing firmly at the distal joint of the punctured finger (restricting blood flow out of the fingertip) and gently squeezing the sides of the fingertip. Avoid excessive squeezing or milking" which will cause tissue fluid to be expressed, compromising specimen integrity.[9,10]

Steps for Puncturing the Finger and Forming Drops of Blood

1. Grasp the finger and quickly puncture it with a sterile lancet in a position slightly lateral to the center of the fingertip.

2. Wipe off the first droplet of blood with a sterile gauze or cotton ball.

3. If blood flow is inadequate, gently message the proximal portion of the finger and then press firmly on the distal joint of the finger.

4. A well-beaded drop of blood should form at the puncture site.

5. Do not let the blood run down the finger or onto the fingernail.

E. Filling the Collection Container

The proper procedure for filling and capping collection containers is somewhat specific to the container used. As a general rule, contact between the skin and the container should be avoided. To prevent specimen clotting, blood must be thoroughly mixed with the anticoagulant after filling the container. Depending on the container and anticoagulant used, the agitation needed can range from gentle rocking to vigorous shaking. Some procedures call for the collection container to be rotated during filling so that anticoagulant will be distributed quickly through the sample.[16] For collectors already familiar with fingerstick blood collection for other purposes (e.g., hematocrit or CBC), there is a tendency to not agitate the blood sample too strongly lest the red blood cells rupture. For blood lead tests vigorous agitation is not an issue because it is more important to prevent clotting than cell rupture.

To facilitate blood flow, many procedures call for the collection container to be held nearly horizontal, with a slight downward angle. Blood flow into the container should be uninterrupted to avoid getting air bubbles in the specimen. Most containers come with appropriate caps, and these should be applied immediately after collection. Again, consulting with the laboratory and knowing the manufacturer's recommendations are important to ensure specimen integrity and suitability for analysis.

Steps For Filling The Collection Container

1. Continuing to grasp the finger, touch the tip of the collection container to the beaded drop of blood.

2. Draw the blood into the container maintaining a continuous flow of blood.

3. When the container is full, cap or seal it as appropriate.

4. Agitate the specimen to mix the anticoagulant through the blood.

5. Check that the container is properly labeled, and place it in an appropriate storage area.

6. Stop the bleeding, and cover the finger with an adhesive bandage. Bleeding should stop quickly. If bleeding is slow to stop, apply pressure to the puncture site with a sterile gauze or a cotton ball. If bleeding continues after 3 to 5 minutes of applying pressure, consult a physician.

References

1. Centers for Disease Control (CDC). Preventing lead poisoning in young children: a statement by the Centers for Disease Control; CDC report no. 99-2230. Atlanta: CDC, 1985.
2. De Silva PE, Donnan MB. Blood lead levels in victorian children. Med J Aust 1980;1:93.
3. Mitchell DG, Aldous KM, Ryan FJ. Mass screening for lead poisoning: capillary blood sampling and automated Delves-cup atomic-absorption analysis. N Y State J Med 1974;74:1599-603.
4. Sinclair DF, Dohnt BR. Sampling and analysis techniques used in blood lead survey of 1241 children in Port Pirie, South Australia. Clin Chem 1984;10:1616-9.
5. New England Consortium of Childhood Lead Poisoning Programs (NECCLP). New England public health laboratory lead testing services [report]. Providence (RI): NECCLPP, 1985.
6. Rosen JF. The microdetermination of blood lead in children by flameless atomic absorption: the carbon rod atomizer. J Lab Clin Med 1972;80:567-76.
7. Milwaukee Health Department (MHD). Generalized procedure fingerstick blood (hematocrit and/or lead test). Milwaukee: MHD, 1988.8. Lyngbye T, Jorgensen PJ, Grandjean P, Hansen ON. Validity and interpretation of blood lead levels: a study of Danish school children. Scand J Clin Lab Invest 1990;50:441-9.
8. Lyngbye T, Jorgensen PJ, Grandjean P, Hansen ON. Validity and interpretation of blood lead levels: a study of Danish school children. Scand J Clin Lab Invest 1990;50:441-9.
9. California Department of Health Services (CDHS). Childhood blood lead screening: fingerstick blood sampling method. Berkeley (CA): CDHS, 1990.3. Mitchell DG, Aldous KM, Ryan FJ. Mass screening for lead poisoning: capillary blood sampling and automated Delves-cup atomic-absorption analysis. N Y State J Med 1974;74:1599-603.
10. New York State Department of Health (NYSDH). Blood lead and erythrocyte protoporphyrin: a recommended procedure for collecting fingerstick blood specimens. Albany (NY): NYSDH, Wadsworth Center for laboratories and Research, 1989.
11. Schlenker TL, Johnson-Fritz C, Mark D, Linke G, Murphy A, Matte, T. Screening for pediatric lead poisoning: comparability of simultaneously drawn capillary and venous blood samples. JAMA 1994;271:1346-8.
12. Schonfeld DJ, Cullen MR, Rainey PM, Berg AT, Brown DR, Hogan JC, Turk DS, Rude CS, Cicchetti, DV. Screening for lead poisoning in an urban pediatric clinic using samples obtained by fingerstick. Pediatrics 1994;2:174-9.
13. Parsons, PJ, Reilly A, Esernio-Jenssen D. Contamination of capillary blood specimens when screening children for exposure to low levels of lead. 1996 (in press).
14. National Committee for Clinical Laboratory Standards (NCLLS). Procedures for the collection of diagnostic blood specimens by skin puncture—second edition. NCCLS publication H4-A2. Villanova (PA): NCCLS, 1986.
15. Wisconsin State Laboratory of Hygiene (WSLH). Complete sampling instructions for capillary lead. Madison (WI): WSLH, University of Wisconsin Center for Health Sciences, 1985.
16. Massachusetts Department of Public Health. Procedure for obtaining fingerstick blood samples. Jamaica Plain (MA): MDPH, Childhood Lead Poisoning Program, 1990.