Lead Guidelines for the Pregnant Migrant Woman

Background

Migrant women may not be recognized as being particularly at risk for lead exposure. Yet they possess a host of risk factors: frequent mobility with residential stays in substandard housing; intermittent work in hazardous occupations; avoidance of reporting illness; environmental exposures related to country of origin; self-importation of products that contain lead; and linguistic, cultural, and access barriers to health education and prevention efforts related to lead.

Routine screening of pregnant women is not currently recommended by any national organizations. Neither is there significant research on the value of such screening. The US Preventive Services Task Force (USPSTF) cites declining levels of blood lead levels in children and a lack of evidence related to the safety of treatment for lead poisoning in pregnancy to support the conclusion that the benefits of screening and treatment do not outweigh the potential harms.[1] Because the migrant population possesses a variety of risk factors for lead exposure,[2] however, the Migrant Clinicians Network recommends that perinatal providers maintain a high level of suspicion for lead exposure and consider routine screening.

With chronic current or past exposure lead is deposited in bone. During pregnancy, as calcium is mobilized from the bone, lead is also released and transfers to the fetus via the placenta. Lead poisoning in turn is the most common disease of toxic environmental origin among children in the United States today.[3] The Centers for Disease Control and Prevention (CDC) estimates that 250,000 children aged 1 to 5 years currently have blood lead levels of 10 µg/dL or greater.[4] Exposure to lead can result in neurological sequelae for the infant and may represent a risk to the mother also.

Guidelines for appropriate screening and treatment of pregnant migrant women are outlined in the sections that follow.

Sources of Lead

Pathways of lead absorption include ingestion, inhalation and maternal fetal transfer via the placenta. Some common sources of exposure for the migrant population are listed here.

- **Lead-based paint** continues to be the principal source of high-dose lead exposure for children and can be a factor for adults also. An estimated 57 million housing units in the United States contain lead-based paint. Risk of exposure to lead from paint in housing built before 1978 is especially high; these conditions exist in an estimated 3.8 million US homes with young children.[5] Lead may be directly absorbed from paint by ingesting paint chips (pica) or, more commonly, by ingestion and inhalation of lead-contaminated house dust.
- **Contaminated dust and soil** are pervasive sources of lead exposure.[6] Concentrations of lead in dust and soil range from near zero to many thousands of parts per million (ppm). Pica practices can result in lead exposure through ingestion of soil or clay.[6]
- **Drinking water** is a common source of low-level lead exposure.[7] Although high concentrations of lead in drinking water occur only in unusual circumstances (such as storage of water in lead-lined tanks), lead in water contributes widely to background exposure. At its source, drinking water is almost always lead-free. Water can, however, become contaminated as it passes through lead pipes or comes into contact with lead solder or brass faucets. Soft water of lower pH poses the greatest hazard because it has the greatest capacity to dissolve lead from pipes and solder.
- **Home remedies, folk medicines, ethnic foods** can be a source of lead poisoning. Numerous case reports have documented this hazard[8] and it appears to be especially common among ethnically isolated groups, including migrant children. Many ethnic products enjoyed by Hispanic families may be contaminated by lead. Seasonings may be contaminated due to the environments where they are processed and candies contaminated by the lead-ink wrappers they are packaged in. Other sources, such as grasshopper ingestion has been linked to large "outbreaks" of lead poisoning in California.[9]

- **Imported lead- glazed ceramics and pottery** may contribute to lead exposure. The hazard becomes especially severe when lead-glazed pottery is used to store acidic foods such as fruit juices or salsa.
- **Toys, jewelry, and crafts** may also contain lead. The CDC website regularly posts recalled products. Examples include animal masks, pendants, plastic play sets, shoes, and fishing poles. The possibilities are numerous, so it is wise to check the CDC site periodically. Surface paints and coatings are the typical culprits.

[See Tables 1 and 2 for additional information about high-risk occupations and other sources of lead exposure.]

Effects of Lead Poisoning

High maternal blood lead levels (BLL) (> 10 µg/dL) can lead to fetal lead exposure resulting in behavioral problems and learning difficulties in the child, and place the mother at risk for pregnancy complications such as miscarriage and low birth weight.[10] Studies in children suggest that the risk of neurological sequelae exists at a lower BLL (5 µg/dL), previously thought to be safe. There is limited research on perinatal lead exposure, but theoretical risk suggests that interventions should be initiated at these lower BLLs.

A range of effects of lead poisoning can occur in the pregnant woman and her newborn, including:

- **Acute poisoning** can be caused by intense exposure to lead, characterized by abdominal colic, constipation, fatigue, anemia, peripheral neuropathy, and alteration of central nervous system function.[3] In severe cases, a full-blown acute encephalopathy with coma, convulsions, and papilledema may occur. In milder cases, only headache or personality changes are evident.[3]
- **Lower-dose exposures** to lead produce toxic effects, which are typically asymptomatic and become evident only on special testing. These effects are evident principally in the following three organ systems: the developing red blood cells, the kidneys, and the nervous system. Hypochromic microcytic anemia, often associated with iron deficiency, is the classic hematologic manifestation of lead poisoning. High lead levels also can produce basophilic stippling in red blood cells. In the kidneys, acute lead poisoning can produce a full-blown, but reversible, Fanconi syndrome. Chronic, low-dose exposure can produce renal fibrosis and hypertension.
- **Asymptomatic impairment to the nervous system** has been shown by extensive research to be caused by lead at levels too low to produce obvious encephalopathy. Asymptomatic school-aged children with elevated lead levels have been found to have significant decrements in verbal IQ scores.[7] This finding was still strongly evident after adjusting for a wide range of socioeconomic, behavioral, and biologic factors. Long-term follow-up of asymptomatic school-aged children with elevated lead levels has shown that they are at increased risk during adolescence for dyslexia, failure to graduate from high school, and delinquency.[11]
- **Early developmental delays**: Most recently, a series of prospective studies of newboms[12,13] has found associations between early developmental delays and umbilical cord blood lead levels as low as 10 to 20 µg/dL.

Medical Evaluation

[**Note:** The following screening and treatment guidelines are adapted from the New York State Department of Health *Lead Poisoning Prevention Guidelines for Prenatal Care Providers*[14] and *Protocol: Lead Screening and Lead Poisoning Management in Pregnancy* by Susanna Cohen, CNM, MS.[15]]

Summary:

- All pregnant women should receive anticipatory guidance on preventing lead poisoning during pregnancy. They should be informed about the major sources of lead in the environment and the means of preventing exposure.
- At the initial prenatal visit, health care providers should assess a woman's risk for current high dose lead exposure. For perinatal providers working with a patient population that consists of large numbers of women who are migrant farmworkers, foreign-born immigrants, and/or Hispanic, routine screening is recommended. The questions below are suggested screening questions appropriate for a Hispanic migrant/immigrant population.

- Those women found to be at risk for current high dose exposure should be tested for blood lead levels and counseled on how to reduce or eliminate current exposure.
- Women found to have a blood lead level of 10 micrograms per deciliter (µg/dL) or greater, should receive additional risk reduction counseling based on their responses to the risk assessment. There is currently no medical treatment recommended for women with elevated lead levels during pregnancy. Women who may be occupationally exposed should be referred to an Occupational Health Clinic for individual guidance.
- At the postpartum visit, providers should advise all women about the major causes of lead poisoning in infants and the means of preventing exposure.

1. Screening

The following questions are suggested to determine if a pregnant woman is at risk for current high dose exposure to lead. They are adapted from other risk assessment questionnaires and are appropriate for migrant or immigrant women. Translations are provided for those who are Spanish speakers. [See Tables 1 and 2 for additional information about high-risk occupations and other sources of lead exposure.]

A. Were you born, or have you spent any time, outside of the United States?
¿Usted nació o estuvo algun tiempo fuera de los Estados Unidos?

B. During the past 12 months, did you use any imported health remedies, spices, foods, ceramics, or cosmetics?
¿En los últimos 12 meses, ha usado cosas importadas como ollas o platos hechas de cerámica, remedios caseros, cosméticos, comidas?

C. At any time during your pregnancy, did you eat, chew on, or mouth non-food items such as clay, crushed pottery, soil, or paint chips?
¿Durante este embarazo, ha comido o masticado algunas cosas como barro, cerámica, tierra o pedazos de pintura?

D. In the last 12 months, has there been any renovation or repair work in your home or apartment building?
¿Durante los últimos 12 meses habia trabajo de reparaciones en su casa o apartamento?

E. Have you or anyone in your family ever had a job or hobby that involved possible lead exposure, such as home renovation or working with glass, ceramics, or jewelry?
¿Ha tenido un trabajo que incluye el plomo como trabajo de reparaciones caseras, trabajo con vidrio, cerámica, o joyeria, o alguien de su familia?

2. Testing

Testing is not recommended for women who are not at risk. If the woman answers "yes" to any of the screening questions, she is at risk for lead exposure, and should have a blood lead test. Given the relatively low incidence of elevated lead levels in pregnancy, it is suggested that unless a woman responds "yes" to a risk assessment question, she not be tested unless there is other reason to suspect potential ongoing exposure to lead. A blood lead test during pregnancy is not indicated for a previous history of childhood lead exposure.

3. Patient Education/Anticipatory Guidance

The Migrant Clinicians Network offers resources and educational materials particularly suited to those who serve migrant workers and the mobile poor: www.migrantclinician.org

Methods to Reduce Lead Exposure in Pregnant Women – Do's and Don'ts

- Do discuss with your employer ways to reduce possible lead exposure on the job.
- Do damp mop and damp dust rather than sweep and dry dust.
- Do avoid drinking acidic liquids from imported ceramic cups, mugs or from leaded crystal.
- Do avoid the use of traditional folk remedies or cosmetics which might contain lead.
- Do avoid lead-related crafts to avoid exposure to lead.
- Do wash hands thoroughly before meal preparation.
- Do run water from the faucet for at least a minute until it runs cold before collecting for drinking and cooking.
- Don't be in the home when renovations that may involve lead-based paint are taking place.
- Don't clean up after renovations involving lead-based paint.
- Don't strip paint from antique furniture, such as cribs and rocking chairs.
- Don't store food in open imported cans.

Nutrition

Poor nutrition associated with migrant populations makes the recommendations below especially important to consider.

- Eat frequent and regular meals. Environmental lead is more easily absorbed on an empty stomach.
- Iron or calcium deficits promote lead absorption. A diet rich in iron and calcium reduces the absorption of lead. Calcium supplements made from bone should be avoided as they may contain lead.
- Breastfeeding is generally safe even if a woman has an elevated blood lead level. However, if a mother with an elevated blood lead level is breastfeeding, the infant's blood lead level should be carefully and frequently monitored. (See **Diagnosis and Management** for details.)

Postpartum Education to Prevent Lead Poisoning In Infants

- Breast milk usually is best for babies, even if your blood lead level is elevated.
- If baby formula is used, take care when preparing it. Use cold tap water – not hot – to make infant formula. Let the cold water run for at least a minute, to flush any lead picked up from the pipes. Purchase bottled water if the home's drinking water exceeds the U.S. Environmental Protection Agency's action level of 15 ppb (µg/L).
- Feed your baby foods that get ahead of lead. Iron fortified formula and cereals can lower your baby's lead risk. Serving foods that are high in iron and calcium can help lower the family's lead risk.
- If your baby uses a pacifier, obtain one that can be attached to your baby's shirt so it won't fall on the floor. Wash the pacifier often. This will help remove any lead dust.
- Wash your baby's hands and toys often. Babies suck their fingers and put things in their mouths - things that might have lead dust on them. Washing helps lower the lead risk.
- Take your baby for regular health care visits and follow the health provider's lead test advice. All children should be tested by their first birthday, and again when they are two years of age.

4. Diagnosis and Management

The following chart represents management recommendations for pregnant women, adapted for the migrant population.

Medical Management of Pregnant Women Based on Blood Lead Levels

BLL (µg/dL)	Interventions	Time Frame for Interventions	Frequency of BLL Follow-up Testing
5 – 9	• Assess for risk factors in greater detail. • Provide risk reduction education and handouts. • Evaluate for adequate intake of calcium, iron, and vitamin C.* • CBC, TIBC, Serum Ferritin, Serum Iron to r/o concomitant Iron deficiency • Monitor BLL. • Coordinate with Pediatrics for follow-up of newborn • Anticipatory guidance regarding infant care	Within 30 days	• Repeat after interval of at least 1 month to assess trend. • If not increasing, repeat in 3rd trimester
10 – 19	**Above actions, plus:** • Consider occupational exposure or other sources • Refer to an occupational health clinic if potential occupational exposure is found (see www.aoec.org for clinic). • Provide iron, Vitamin C and Calcium (non-bone) supplementation PRN.	Within 30 days	Repeat after interval of at least 1 month to assess trend. If BLL 10-19, repeat in third trimester. If repeat test >20, see actions below. Obtain a maternal BLL or umbilical cord lead level (UCLL) at birth if maternal BLL > 10 at anytime during the pregnancy.
20 – 44	**Above actions, plus:** • Evaluate for other symptoms.† • Refer woman to the local health agency for environmental investigation and abatement if occupational exposure, hobbies and folk remedies have been ruled out as a source of lead exposure. • For advice about patient counseling concerning teratogenic effects, consult a Teratogen Information Service (see www.otispregnancy.org).	Within 2 weeks	Within 2 weeks and then monthly to assess efficacy of case management Obtain a maternal BLL or umbilical cord lead level (UCLL) at birth if maternal BLL > 10 at anytime during the pregnancy. Rescreen for maternal BLL at 1 month PP if BLL > 10 anytime during the pregnancy
>45	**Above actions, plus:** • Consult with lead poisoning specialist to consider hospitalization and chelation with CaNa2EDTA if pregnancy is in late 2nd or 3rd trimester • Immediate removal from the contaminated environment may be indicated.	Within 24 hours	Within 24 hours and then at frequent intervals depending on clinical management and BLL trend Obtain a maternal BLL or umbilical cord lead level UCLL at birth if maternal BLL > 10 at anytime during the pregnancy. Rescreen for maternal BLL at 1 month PP if BLL > 10 anytime during the pregnancy
Postpartum/ Newborn	• Provide postpartum education to mother. • Coordinate care with pediatric provider. • Breastfeeding is generally safe for women with elevated BLL. • If the infant's blood lead level is 10 g/dL or greater and rising, and no remediable environmental source of lead can be detected, breastfeeding should be discouraged.		If maternal BLL > 10 at anytime during the pregnancy, test infant's BLL within 2 weeks of baseline and at least monthly.

Adapted from New York State Department of Health Guidelines (14)and New City Department of Health and Mental Hygiene Guidelines.[16]

*Adequate stores of calcium and iron may decrease gastrointestinal absorption of lead. Adequate stores of calcium may decrease mobilization of lead from maternal bone. Vitamin C may increase renal lead excretion.

† The majority of adults have no symptoms of lead poisoning. Symptoms including headaches, crampy abdominal pain, anorexia, constipation, fatigue, malaise, myalgias, and arthralgias typically occur at BLLs ≥60 µg/dL, but can occur at BLLs ≥25µg/dL.

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TABLE 1. Jobs and Industries with Potential Lead Exposure

Note that agriculture often contains these aspects of work.

GENERAL

- Lead production or smelting
- Brass, bronze, copper, or lead foundries
- Ammunition/explosives production
- Scrap metal handling
- Firing ranges
- Machining or grinding lead alloys
- Manufacture of radiation shielding
- Repair/replacement of refractory material in furnaces
- Ship building/repairing/breaking
- Mining

INDUSTRY

- Battery manufacturing or recycling
- Automotive radiator repair
- Lead soldering
- Ceramic manufacturing
- Cable/wire stripping, splicing or production
- Rubber manufacturing
- Plastics manufacturing
- Leaded glass manufacturing
- Paint/pigment manufacturing

CONSTRUCTION

- Renovation, repair or demolition of structures with lead paint
- Welding or torch-cutting painted metal
- Sandblasting, sanding, scraping, burning, or disturbing lead paint
- Use or disturbance of lead solder, sheeting, flashing, or old electrical conduit
- Plumbing, particularly in older buildings

TABLE 2. Some Common Non-occupational and Environmental Sources of Lead Exposure

Immigration should be recognized as an environmental risk: Asia, Mexico and Central America have particularly high levels of lead still available in everyday products. Industrial pollution in Asia is a well-known source.

- Remodeling or painting pre-1978 housing
- Peeling paint
- Ethnic medicines or folk remedies (e.g., azarcón, greta, pay-loo-ah, kandu, some Ayurvedics)
- Ethnic Foods such as fried grasshoppers, self-imported spices, and candies. The wrappers of these foods may also contain lead, as has been shown with candies.
- Pica (ingestion of lead-containing nonfood items, e.g., soil or ceramics, plaster, or paint chips)
- Retained lead bullet or fragments
- Melting lead for fishing weights, bullets, or toys
- Lead solder in stained-glass artwork
- Lead-soldered cans
- Lead-contaminated candies
- Backyard scrap metal recycling
- Moonshine (liquor from a homemade still)
- Antique pewter plates, mugs, utensils, toys
- Imported brass or bronze kettles, cookware, lead-glazed tableware or cooking vessels
- Leaded crystal tableware
- Mine tailings
- Beauty products such as kohl eye make-up, certain hair dyes
- Imported toys