Despite a steady decline in average blood lead levels in the U.S., lead poisoning remains an environmental health issue for at risk children and adults. Women of childbearing age are of particular concern because lead freely crosses the placenta. Fetal lead uptake is constant and cumulative and the lead is stored in bone, blood and liver.

In utero lead exposure is associated with decrements in neurocognitive and behavioral function in the infant and these effects have been seen at blood lead levels below the current CDC action level of 10 µg/dl whole blood. High levels of lead in utero (> 25 µg/dl) have resulted in significant developmental delays. Since the CDC action level was reduced in 1991, studies have demonstrated that there continue to be early developmental deficits in infants with low lead exposure in utero. When this exposure does not continue after birth, some studies have indicated that these children's developmental scores normalize by age 3 years. If the lead exposure continues, the effect on developmental scores is cumulative.

The New York State Department of Health, in collaboration with the New York District of ACOG, asks obstetricians to discuss lead exposure during pregnancy and to conduct a risk assessment (see Table 1) of all pregnant women early in pregnancy. Risk factors for these women include occupational exposure, hobbies, pica, (for an overview of pica, please see the article on page 2) household renovation during pregnancy, recent arrival in the U.S., use of imported herbal remedies, and a history of childhood lead poisoning. If one or more of these risk factors is present, a blood lead level should be obtained.

Occupational exposures are specific to the industries found in a particular community (see Table 2 for a list of the most common) and not all of them are obvious. Plastics manufactured for the electronics industry contain lead compounds. Homes built before the final ban on leaded paint for residential use (pre-1978) are a risk for families renovating in preparation for a new baby. Women with a history of childhood lead exposure may have bone lead that will be released into the blood during pregnancy.

When blood lead test results are elevated, the major intervention should be removing the lead hazard from the environment. Iron deficiency enhances lead absorption, so counseling to improve iron intake through diet and supplementation may be worthwhile. Chelation to reduce blood lead levels is very rare in pregnancy.

Screening pregnant women for lead exposure will identify those who may be at risk. Identifying and educating women during pregnancy may prevent further exposure during the pregnancy and allows the newborn to come home to a lead safe environment.

The Central/Eastern New York Lead Poisoning Resource Center welcomes your questions and observations about lead poisoning in pregnancy. The Resource Center is available for consultation about pregnant women with elevated blood lead levels.

**Table 1  SCREENING QUESTIONS**

- Do you live in a home or apartment built before 1978?
- Have there been any recent home improvements or repairs where you live?
- Were you born or have you ever lived in another country?
- Do you use medicines, cosmetics or spices from another country?
- Do you or someone with whom you live have a job or hobby that could bring you into contact with lead?
- Do you use pottery that was made in another country, painted china or leaded glass?
- Have you ever eaten or chewed crushed pottery, soil, paint chips or other things that aren't food?

**Table 2  Some Occupational or Hobby Lead Exposures**

<table>
<thead>
<tr>
<th>Auto repair shops</th>
<th>Stained glass/jewelry making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrap metal recycling</td>
<td>Firing range use</td>
</tr>
<tr>
<td>Electronics manufacturing</td>
<td>Antique furniture refinishing</td>
</tr>
<tr>
<td>Construction/demolition workers</td>
<td>Making bullets and fishing sinkers</td>
</tr>
<tr>
<td></td>
<td>Ceramics work</td>
</tr>
</tbody>
</table>

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What is pica?

Pica is defined as the intentional ingestion of non-food items after 18 months of age. Three categories of pica are commonly seen among pregnant women:

- Geophagia -- consumption of soil, clay, chalk, or clay-based substances
- Pagophagia -- consumption of ice
- Amylophagia -- consumption of laundry or corn starch

There are a variety of other items consumed by individuals with pica, including ashes, household objects, stones, pellets, paint chips, wax, paper, toothpaste, baking soda, and coffee grounds.

How does it relate to pregnancy?

Often observed in young children, pica is sometimes seen in pregnant women. In adults, the practice is often unreported due to the patient’s embarrassment. Although the cause of pica in pregnancy has not been determined, research has established risk factors, complications, and interventions. Two of these topics, risk factors and complications, are discussed below.

What factors affect a woman’s likelihood to experience pica during pregnancy?

- Cultural acceptance of the behavior
- History of pica during childhood
- Family history of pica
- Psychological factors, such as stress, oral fixation, habits, or disorders

It should be noted that pica in pregnancy has been observed in many diverse cultures. Among them are the southeastern United States, Mexico, Jamaica, Haiti, Kenya, and Nigeria. In some of these cultures, geophagia is considered a remedy for a variety of gastrointestinal symptoms; in others, it is believed to affect fertility and reproduction. Still other cultures consider soil or clay a suitable source of necessary vitamins and minerals. There is research that suggests a correlation between pica and nutritional deficiencies, such as a lack of iron, calcium, or potassium. It is unclear whether these deficiencies cause pica or whether they are only an effect of pica. Some women report that they ingest non-food items simply because they enjoy their texture, scent, or taste.

How does pica increase risk for lead exposure?

Ingested items may include lead sources, especially if geophagia is present. Soil around buildings built prior to 1978 may be contaminated by deteriorating paint; soil near roadways may be contaminated due to historic vehicle emissions; soil in areas near industrial sources of lead pollution may also be contaminated. Researchers report cases of Mexican-born women consuming lead-glazed clay pottery during pregnancy. Often, this pottery is brought to the U.S. from Mexico by the woman or her family to be broken or crushed and then eaten here.

What additional health risks are associated with pica during pregnancy?

Pica also places patients at risk for parasitic infection, abdominal obstruction, vitamin and mineral deficiency, dental complications, and constipation.
Pica in Pregnancy. What is the bottom line?

Until the etiology of pica during pregnancy is better understood, all obstetric patients should be questioned about their eating habits, including the consumption of non-food items. In order to facilitate the conversation, it may be helpful to frame it within the context of cravings in general.

Want to learn more?


Journal Reviews: Prenatal Lead Exposure

by Maureen Famiglietti RN, BSN

The following journal articles are related to prenatal lead exposure and its effects:

Lead exposure in pregnancy: a review of the literature and argument for routine prenatal screening. Gardella C., Obstetrical and Gynecological Survey, 2001 Apr; 56 (4):231-8. Dr. Gardella outlines the correlation between maternal lead exposure and fetal blood lead levels in this review. She provides background information about the effects of in utero lead exposure on infant developmental landmarks. She supports prenatal risk assessment and blood lead testing as appropriate with the goal of identifying and removing lead hazards from the environment.

Elevated blood lead levels in pregnant women: identification of a high-risk population and interventions. Rastogi S et al., J. Perinat. Med. 2007; 35(6): 492-6. This study was conducted to estimate the prevalence of elevated blood lead levels (BLL) in pregnant women seen in a community hospital. The authors also looked at the effect of routine preventive practices on the maternal BLL and the relationship between maternal and neonatal BLL.

Reduced intellectual development in children with prenatal lead exposure. Schnaas L. et al., Environ Health Perspect. 2006 May; 114(5): 791-7. A cohort of 175 children in Mexico City was followed for 10 years. IQ measurements were made at ages 6 years and 10 years. Blood lead measurements were collected during the mother’s pregnancy and continued annually for the study cohort until the children were 10 years of age. The authors concluded that lead exposure around 28 weeks gestation was critical for later intellectual development and there was no evidence of a low end threshold for this effect.

A prospective study of prenatal and childhood lead exposure and erythropoietin production. Graziano J. et al., J. Occup Environ Med. Sep 2004; 46(9): 924-9. The authors test the hypothesis that chronic lead exposure may be associated with inadequate serum erythropoietin (EPO) concentration. The analyses included both average blood lead levels over 12 years of life as well as bone lead results obtained between ages 11-13 years of age. The study finds that there does appear to be a decline in EPO production with long term lead toxicity and this may contribute to anemia associated with lead poisoning.

Association of prenatal and childhood blood lead concentrations with criminal arrests in early adulthood. Wright JP et al., 2008 May; PLoS Medicine 5 (5):e101. In a follow-up report to the Cincinnati longitudinal childhood lead study, the authors report on the association of prenatal and childhood lead exposure to the number of arrests for the study subjects as reported in official criminal justice records. Prenatal and postnatal blood lead concentrations are associated with higher rates of total arrests and/or arrests for offenses involving violence.