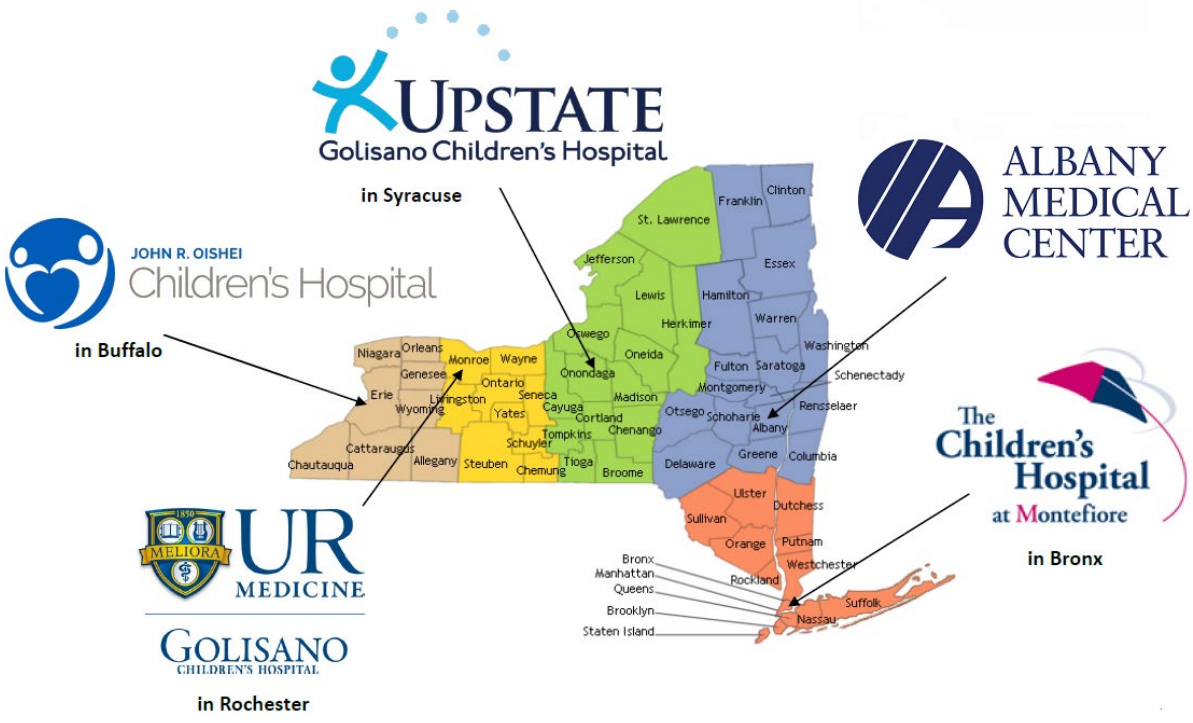
# Upstate NY Regional Lead Resource Centers Newsletter October 2021

**Contents:**



## Contact your Regional Lead Resource Center

The NYSDOH Lead Poisoning Prevention Program (www.health.ny.gov/environmental/lead/) funds our centers to provide medical expertise and guidance to health care providers managing treatment of children and adults with high blood lead levels. Please reach out to us with your questions, to arrange a consultation, or schedule a training for your staff. Find our contact information at: www.health.ny.gov/environmental/lead/exposure/childhood/regional_lead_resource_centers.htm.



## What Providers Need to Know About New NYS Lead Poisoning Prevention Guidelines

NYS regulations regarding lead poisoning prevention changed in October 2019.

Revised risk assessment questions must be asked at every well child visit between 6 months and 6 years (see https://www.health.ny.gov/publications/6670.pdf).

All children must get a blood lead test at or around age 1 and again at or around age 2 and whenever a potential risk of lead exposure is present.

Any blood lead levels of 5 ug/dL or greater must be followed up. If it was a capillary/finger-stick level then the follow up must be a venous draw.

For children with venous levels of 5 ug/dL or greater, the health care provider must complete a clinical lead exposure assessment on the patient and provide the local health departments with the following information:

- Hemoglobin/hematocrit or CBC - it would be beneficial to automatically have these drawn with all initial or confirmatory venous lead levels. Local health department staff are often having to backtrack and wait 3 months or more for this for various reasons such as parents' refusal or because it was never ordered.
- Recent assessments - if not done recently (3-6 months for infants and toddlers; 6-12 months for over 3 year olds) another assessment needs to be done:
    - Physical with complete neuro exam
    - Nutritional assessment including an assessment of iron, calcium, and Vitamin C intake and consideration of checking labs for iron deficiency
    - Developmental assessment using a standardized tool

Please note and let parents know: the new guidelines require two venous tests less than 5 ug/dL greater than 3 months apart for discharge from case management by the local health department.

Complete Guidelines for Health Care Providers for the Prevention, Identification, and Management of Lead Exposure in Children are on the NYSDOH website at www.health.ny.gov/publications/6671.pdf. Copies for your practice (either booklet or laminated wall chart format) can be ordered from: www.health.ny.gov/forms/order_forms/lead.pdf

## What does the local health department do when a child has an elevated lead level?

The Advisory Council on Lead Poisoning Prevention provides guidance to the New York State Department of Health (NYSDOH) regarding lead programs, plans and laws concerning childhood lead poisoning. Local health departments (LHDs) are supported by NYSDOH in their lead poisoning prevention activities by providing funding, materials and other support throughout all counties in NYS.
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Public Health
Prevent. Promote. Protect.

The main goal of Lead Poisoning Prevention Programs is to develop and coordinate activities to prevent lead poisoning and minimize exposure to lead. LHDs contribute to this goal by providing case management and follow-up services, education on risk reduction and nutrition, and environmental investigations.

LHDs utilize LeadWeb, a web-based tracking and data storage system, to identify new cases of elevated lead levels and collect information on housing-related hazards and environmental follow-ups for individual cases.

Elevated lead levels are reported by all clinical laboratories to NYSDOH which transfers that information into LeadWeb and NYSIIS. LHDs review LeadWeb daily for new cases in their respective counties. County to county collaboration occurs if a patient's elevated blood lead level is reported to the wrong county health department or a patient moves to a different county.

The LHD contacts the parent or guardian of any child with an elevated venous lead level to identify potential sources of exposure for the child and to arrange a home inspection.

LHDs provide education to families regarding what lead poisoning means and the potential long term effects if exposure is not addressed. LHDs provide information about risk reduction, nutritional counseling on foods, and discussion on plan of care. LHDs can also provide referrals to programs for developmental support/services and WIC. LHDs place referrals for home to receive an environmental investigation.

Environmental investigations of any location where the child spends more than 8 hours per week to assess for potential lead hazards will occur.

Investigations include:
- Testing of all friction surfaces in the home for lead hazards with an XRF (x-ray fluorescence) analyzer
- Education around areas of concern, how to decrease childhood exposure to lead hazards and proper cleaning techniques
- Work with the landlord or property owner to remediate lead hazards and make the home safe from lead
- If remediation of lead hazards in the home is required, it must be done using lead-safe work practices. The LHD will arrange for another home inspection after the work is completed.

Collaboration between the patient's primary care provider and LHDs occurs to provide background information on the child including results of other lab work, developmental screening, nutritional assessment, and other information the PCP may find pertinent. Once a plan is in place, collaboration with the PCP occurs regarding follow up blood work or medical treatments that may be necessary.

LHDs continue to do case management for the child (providing appointment reminders and education) until the child has two venous blood test results less than 5 µg/dl obtained at least 3 months apart.

## Lead Poisoning in Children and Pregnant Women: An interactive CE module for NYS providers

This online continuing education module for NYS physicians, nurses, and licensed social workers provides the latest information about lead as well as the 2019 changes to the NYS regulations related to assessment and follow-up of children with elevated blood lead levels. Physicians, nurses and social workers can obtain 1.0 hour of CME/CNE/Social Work CE for completing the on-line module. The cost is $15 (or free for employees of University of Rochester Medical Center and its affiliates).

Find More Information and to register go to: https://bit.ly/NYSleadCE

This module was developed by the WNY Lead Poisoning Resource Center's Rochester Office with funding, input, and approval from the NYSDOH Lead Poisoning Prevention Program.

**If you have no need for CE credit, a video and slides are available free for anyone who wants to learn more:**

- Non-CE Video - Lead Poisoning in Children and Pregnant Women: A presentation for NYS Healthcare Providers
- Non-CME Slides with Web links - Lead Poisoning in Children and Pregnant Women - for NYS Healthcare Providers


## CDC Recommendations for Breastfeeding Mothers Affected By Lead

Protecting children from exposure to lead is important for lifelong good health. No safe blood lead level has been identified. Even low levels of lead in blood have been shown to affect IQ, attention span, and academic achievement. The effects of lead exposure cannot be corrected.

### How Might Lead Affect Breastfeeding Mothers and Infants?

Women who have been or are currently exposed to lead can expose their fetus or infant to lead during pregnancy and lactation through blood and breast milk, which can have long-term effects on the neurodevelopment of their child. During pregnancy and lactation, mothers can have lead in their blood or breast milk for two reasons:

1. They have been directly exposed to lead during pregnancy or lactation.
2. Lead that is stored in a woman's bones and teeth from a prior exposure to lead can be released during pregnancy or lactation.

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**Can Mothers Breastfeed Their Children If They Have Elevated Blood Lead Levels (BLLs)?**

If a pregnant or lactating woman has blood lead levels (BLLs) ≥5 µg/dL, the health care provider should attempt to determine the source(s) of lead exposure, working with the local health department and occupational medicine specialists as needed for environmental assessment and case management.

It is recommended that mothers with BLLs <40 µg/dL should continue to breastfeed, but it is important to note:

- The infant's BLLs should be monitored if the mother's BLLs are between 5 and 39 µg/dL. Breastfeeding should continue for all infants with BLLs below 5 µg/dL.
- If the infant's BLLs are rising or failing to decline by 5 µg/dL or more, the healthcare provider should contact the local health department for environmental sampling. If no external source is identified, maternal BLLs are ≥20 µg/dL and the infant's BLLs are ≥5 µg/dL, then breast milk may be the source of lead exposure. Mothers should consider temporarily pumping and discarding their breast milk until maternal BLLs decrease.

**Mothers with BLLs ≥40 µg/dL are encouraged to pump and discard their milk until their BLLs drop below 40 µg/dL.**

- Testing breast milk for lead is not recommended.

**What Are Some Kinds of Lead Hazards Breastfeeding Women Might Be Exposed To? How Can They Protect Themselves and Their Infants? Breastfeeding women should be aware of or avoid the following:**

- Lead-based paint (typically found in homes built before 1978). Stay away from repair, repainting, renovation, and remodeling work. Test paint before starting home improvements that disturb paint. If hiring someone else to perform work, make sure they follow lead paint repair rules from the Environmental Protection Agency (EPA external icon
- Pica. Never eat or mouth clay, soil, pottery, or paint chips because they may be contaminated with lead.
- Tainted food. Use caution when eating candies, spices, food additives, and other foods from abroad, especially if they appear to be noncommercial products of unknown safety. Limit eating game meat—such as deer—that have been hunted with lead ammunition.
- Tainted food ware. Avoid using imported lead-glazed ceramic pottery and pewter or brass containers or utensils to cook, serve, or store food. Avoid using leaded crystal to serve or store beverages. Do not use dishes that are chipped or cracked.

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- Tainted medicine or personal care products. Avoid imported medicines and herbal remedies (azarcon, Ayurvedics); cosmetics and ceremonial powders (tiro, kohl, kajal, surma); and personal care products (litargirio) that may contain lead.
- Water with lead levels exceeding 15 parts per billion (ppb). If water lead levels exceed EPA's action level of 15 ppb, use bottled water or water from a filtration system certified by an independent testing organization to reduce or eliminate lead for cooking and drinking.
- Some occupations or hobbies that may involve lead exposure. These include construction or home renovation/repair in pre-1978 homes; firing ranges and military or police work; battery or electronics manufacturing or recycling; soldering or casting metal; oil field work; mining; and aviation gas used in small planes. If a household member works with lead, take precautions to avoid taking home lead dust in cars or on clothing, skin, hair, and shoes.
- Prior exposure. Prior significant exposure such as childhood environmental exposure or previous occupational exposure could lead to large stores of lead in bone which can become mobilized during pregnancy.
- Recent immigration. Recent immigration to the United States from countries where relatively high lead exposure is endemic, such as countries where leaded gasoline is still used or where use of consumer products containing lead is widespread.

Reference: Centers for Disease Control and Prevention. Breastfeeding. Lead. U.S. Department of Health & Human Services. www.cdc.gov/breastfeeding/breastfeeding-special-circumstances/environmental-exposures/lead.html

## Hunting Season is fast approaching…Choose Non-Lead Ammunition!

New development of alternative non-lead ammunition allows hunters the same performance and accuracy of traditional lead-based ammunition without fragmentation. Non-lead ammunition consists of solid copper or copper alloys (90-95% copper and 5-10% zinc) and is available in a large variety of calibers and bullet weights for rifle, shotgun and muzzleloader.

For more information, please consult the DEC website www.dec.ny.gov/outdoor/48420.html

*Comparison of two .270 caliber bullets shot into a modified rain barrel for collection. The copper jacket lead-core bullet (left) is heavily fragmented compared to solid copper bullet (right) that retained its original shape upon impact. (Photo courtesy of the National Parks Service)*

## Recent Articles

**Effects of Individual and Neighborhood Characteristics on Childhood Blood Lead Testing and Elevated Blood Lead Levels, a Pennsylvania Birth Cohort Analysis.**
Chen, Yeh-Hsin, et al. *Journal of Primary Care & Community Health*, vol. 12, 2021
https://journals.sagepub.com/doi/pdf/10.1177/21501327211017780

This study looked at the impacts of maternal, infant, and neighborhood characteristics on lead testing and elevated blood lead levels among children under two years of age by using generalized linear models. They followed infants in Pennsylvania born in 2015 and 2016 for 24 months and linked birth certificate data to blood lead testing data and neighborhood data from 2015-2018.

Approximately half of these infants received a blood lead test before 2 years of age, with the highest rate of lead testing occurring in non-Hispanic black children (63%). Additionally, the study looked at maternal educational attainment, and found that lead testing rates were highest among children of mothers who had at least a high school education, or some college education. Overall, the study found the lowest rates of lead testing to be among children who were non--Hispanic whites, who were born to mothers with the lowest or highest educational attainment, whose payment source for delivery was either private insurance or self-payment, who didn't enroll in WIC, and who lived in less deprived neighborhoods.

In terms of children with elevated blood lead levels (EBLL), non-Hispanic black children had the highest percentage (4.4% for both 2015 and 2016) as compared to the lowest which was among non-Hispanic white children (2.1% in 2015 and 1.9% in 2016). Compared with non-Hispanic white children, Hispanic and non-Hispanic Asian children had significantly higher odds of having EBLLs in the least poor neighborhoods, while non-Hispanic black children had significantly higher odds in the lowest household income and the poorest neighborhoods. When looking at maternal educational attainment, children born to mothers with less than a high school education level had the highest likelihood of having EBLLs. A few additional characteristics were associated with higher rates of lead testing and higher rates of EBLLs. These included children enrolled in WIC, children whose mothers smoked either before pregnancy or during pregnancy, children whose mothers had infections during pregnancy, and children who lived in neighborhoods of higher quartiles of poverty and old housing.

The study also sought to identify significant independent factors of the likelihood of getting a lead test and having a confirmed EBLL. It is important to create this distinction to identify those at highest risk who may be missed because they were never tested. The study found that when looking at the primary payment method at the time of delivery, those mothers who were uninsured and instead utilized self-payment had children with 69% lower odds of having a lead test, but had

89% higher odds of having an EBLL. Additionally, children born to mothers with a less than high school education had 15% lower odds of being lead tested, but they had 75% higher odds of having an EBLL.

These results were consistent with other studies that have been done and align with various risk factors we know to exist with lead exposure. The study concluded that additional research is needed to address whether the racial differences seen regarding the risk of having EBLLs exacerbates or narrows with increasing levels of neighborhood socioeconomic characteristics. Looking further at this data and the various relationships can help to identify which combination of factors lead to the highest risk of lead exposure with the hopes that more tailored interventions can be put into practice to protect children from lead exposure.

**How Can We 'Get the Lead out' without Chelators?**
Mazer-Amirshahi, Maryann, et al. *Journal of Medical Toxicology*, vol. 17, no. 4, 2021
www.ncbi.nlm.nih.gov/pmc/articles/PMC8143065/

This article looks at the recent chelator shortage in January 2021, when there was a disruption of the production of succimer. Despite the need for chelators, there have been 10 different shortages since 2006 (succimer, BAL, calcium disodium EDTA, and penicillamine). Chelators are commonly manufactured by a single company and in a single formulation. Physicians may find themselves in a difficult spot during a shortage with no medication to treat children with highly elevated blood lead levels. Alternative options can be used when some but not all chelators are unavailable, such as using succimer in place of calcium disodium EDTA or vice versa. However, if both of these commonly used chelators are unavailable, additional alternative options such as BAL and penicillamine, the use of which are not ideal due to route of administration and adverse effects, need to be considered. In addition to shortages, access is another frequent barrier. Succimer is generally difficult to obtain through local pharmacies since it is not prescribed for other medical conditions, so community pharmacies are unlikely to stock it even when there is no shortage of it. Insurance prior authorization also generally is needed, potentially causing further delay in treatment.

Additionally, the FDA cannot force manufacturers to produce a medication, even if there is great need. A few solutions the article points out includes incentives (tax credits/rebates for manufacturing facilities in good standing/temporary market exclusivity/accelerated approval for another product), utilizing FDA's extension of expiration dates if a shortage is anticipated or occurring, utilizing FDA's temporary importation of drugs to ensure supply, and the use of compounded drugs. However, all of these possible solutions come with various barriers and most of the time lack feasibility. *(continued on next page)*

The article makes a point to identify sustainable solutions while putting the majority of responsibility on healthcare systems and poison centers to both carefully monitor stock and the management of patients in shortage periods. It is additionally recommended that further research be done regarding the use of alternative chelators by medical toxicologists, which would help to expand the number of chelating agents available. The authors encourage medical toxicologists and poison centers to collaborate with policymakers, industry, larger healthcare organizations and other stakeholders to identify and work through solutions.

The bottom line is that shortages of chelators and associated barriers to access continue to negatively impact the most vulnerable populations and alternative options need to be in place so children who have highly elevated blood lead levels can be treated as soon as possible.

**Prenatal Lead Exposure and Cord Blood DNA Methylation in the Korean Exposome Study.** Park, Jaehyun, et al. *Environmental Research*, vol. 195, 2021, p. 110767., https://doi.org/10.1016/j.envres.2021.110767. https://pubmed.ncbi.nlm.nih.gov/33515580/

The authors of this article performed an epigenome-wide association study (EWAS) to assess trimester specific effects on maternal lead exposure on cord blood DNA methylation and to see if the infants' sex had any influence on effect. Previous studies have shown a correlation between prenatal exposure to heavy metals and the methylation of a gene related to early-life risk of neurobehavioral phenotypes. As well, the impact of DNA methylation may also account for adverse effects of heavy metals on neuron development.

The association between blood lead concentration and methylation status of CpG sites were tested by utilizing a linear regression model. The following data were included as covariates: infant sex, maternal pre-pregnancy BMI, maternal current smoking status, family income, and estimated leukocyte compositions.

The study found that prenatal lead exposure was associated with alteration in cord blood DNA methylation which varied based on infant sex. It was found that the level of maternal blood lead was associated with 18 CpG sites during early pregnancy, in male infants only. The most statistically significant differentially methylated position (DMP) was located near the genes encoding for PREX1. The study explains that since lead causes oxidative stress, PREX1 may have a role in that process, which could potentially cause DNA methylation. One additional CpG site near the NBAS gene, was found to be hypomethylated differently based on lead exposure in late pregnancy but was dependent on maternal lead level. In female infant samples, no significant associations were found between DNA methylation and lead concentrations. *(continued on next page)*

The significance of sex-related differences being associated with DNA methylation and maternal lead exposure remains unclear but prior studies have assessed possible mechanisms. Four explanations have been made thus far:

- Sex-related differences in disease outcomes after lead exposure may reflect the different duration of epigenetic events in the course of development, which may impact fetal vulnerability and multi-organ damage after lead exposure.
- The effects of prenatal lead exposure on endocrine function may vary in developing male and female infants.
- DNA methylation profiles in the brain are sexually dimorphic and regulated by sex hormones and could be related to the distribution and density of estrogen receptors.
- The impact of lead exposure is dependent on maternal response and that could differ among which stage of pregnancy the mother is in.

The study did not investigate the biological mechanisms related to the mentioned methylation changes and indicates that further research needs to be done to assess DNA methylation and maternal lead exposure, specifically regarding the sex-related differences on fetal development and disease susceptibility.