

Science Spotlight

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Lead Exposure Linked to Thyroid Dysfunction During Pregnancy

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A new [study](#) by NIEHS-funded researchers at Columbia University suggests that lead exposure during pregnancy reduces maternal thyroid function, a condition associated with poor birth outcomes and lower IQ among school-aged children. Despite its high prevalence and adverse health outcomes, little is known about the environmental determinants of maternal thyroid dysfunction. This study, led by Pam Factor-Litvak, Ph.D., and doctoral student Linda Kahn, is the first to explore the relationship between lead exposure and thyroid function among pregnant women.



The difference in environmental lead between two towns in Kosovo (part of former Yugoslavia) provides a natural contrast to examine the effects of lead exposure on health. Women living in Mitrovica, the site of a lead smelter, refinery, and battery plant, are exposed to high levels of environmental lead. Women living in Pristina are relatively unexposed.

(Photo courtesy of Central Intelligence Agency [Kosovo], via Wikimedia Commons)

The thyroid gland produces hormones that help regulate metabolism. Hypothyroidism is a condition where the body does not produce enough thyroid hormone, causing many of the body's functions to slow down.

“Hypothyroidism during pregnancy can be especially harmful to the developing fetus because the mother's thyroid hormone regulates fetal brain development during the first and second trimesters,” Factor-Litvak explained. Children of mothers with overt hypothyroidism are at risk of cretinism, a condition of severely stunted mental and physical growth. Some studies suggest that subclinical maternal hypothyroidism is associated with reduced cognitive function in early childhood.

This research is part of the Yugoslavia Prospective Study of Environmental Lead Exposure, a longstanding population-based study funded by the NIEHS to examine the associations between lead exposure and adverse pregnancy and health outcomes. The cohort, which was established between May 1985 and December 1986, recruited women during midpregnancy from two towns in Kosovo, which was in the former Yugoslavia. Women living in Mitrovica were exposed to high levels of environmental lead from a nearby lead smelter, refinery, and battery plant, whereas women from Pristina were relatively unexposed.

The researchers collected blood samples from pregnant women enrolled in the study and analyzed them for blood lead concentration. Approximately 15 years after collection, the samples were analyzed for three measures of thyroid function—free thyroxine, thyroid stimulating hormone, and thyroid antibodies. These thyroid measures have been shown to resist deterioration during freezing, storage, and thawing.

They found that women from Mitrovica, who were more highly exposed to lead, had significantly lower levels of the thyroid hormone thyroxine and significantly higher levels of thyroid antibodies than did women from Pristina. Both of these measures are indicative of higher risk of maternal hypothyroidism. Most strikingly, women from Mitrovica had nearly five times more thyroid antibodies compared with women from Pristina.

These findings point to one potential mechanism by which lead exposure mediates maternal thyroid function. The increased levels of thyroid antibodies observed in women with high blood lead levels suggests that lead exposure triggers an autoimmune response that causes the body to produce antibodies that attack the mother's thyroid gland and its hormone products.

These results have implications for low- and middle-income countries where lead is not closely monitored and lead poisoning is a serious health concern. From a public health standpoint, efforts to reduce lead exposure should continue to be a priority. “There are still areas in the world where people are exposed to high levels of environmental lead due to the mining and processing of lead and the recycling of batteries or other lead containing products. Our results indicate that maternal hypothyroidism may be a serious public health problem in regions where lead exposure is unregulated,” Factor-Litvak said.

Citation:

Kahn LG, Liu X, Rajovic B, Popovac D, Oberfield S, Graziano JH, Factor-Litvak P. 2014. Blood lead concentration and thyroid function during pregnancy: results from the Yugoslavia prospective study of environmental lead exposure. EHP; doi: 10.1289/ehp.1307669 [Online 27 May 2014].