Reducing Harm from Lead Battery Recycling in Vietnam

By Megan Avakian

Researchers funded by the NIH Fogarty International Center (FIC) used study results as a call to action to clean up lead contamination in Dong Mai village, a lead battery recycling center in northern Vietnam. The research team, which included NIEHS grantees, a collaboration between the University of Washington (UW) and the Vietnam National Institute of Occupational and Environmental Health (NIOEH), found widespread lead contamination throughout Dong Mai village and high blood lead levels in all

children they tested.

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4637436/) They used these results to highlight the need for urgent lead reduction interventions in Dong Mai.

Workers in a lead battery recycling facility outside Dong Mai village break batteries apart and separate metal and plastic components.
(Photo courtesy of Gerry Croteau)

Recycling batteries to salvage lead for profit is common in Vietnam and other developing countries. The recycling process often results in widespread lead contamination and exposure. “Lead battery recycling in this village took place at homes for decades, potentially exposing children to dangerously high levels of lead,” said William Daniell, M.D., lead study author and associate professor in the University of Washington Department of Environmental and Occupational Health Sciences. “Efforts to shift home-based recycling to an industrial zone outside the village increased after a 2006-2007 study from NIOEH reported high levels of lead in the environment and in urine of children living in Dong Mai.”

By 2011, some, but not all, the household lead battery recycling activities had moved outside the village. The UW-NIOEH research team wanted to determine if child lead exposure remained a problem in Dong Mai after this shift. They measured blood lead levels in 109 children ten years old or younger and found all the children had high blood lead levels. Nearly one third of these children had blood lead levels of 45 micrograms per deciliter or higher, the level at which the U.S. Centers for Disease Control and Prevention recommends considering chelation treatment to remove lead from the body.

The researchers also measured soil and surface lead in several homes and an elementary school. Surface lead concentrations were very high in all 11 sampled homes, averaging 95 micrograms per deciliter — 2,375 times the U.S. Environmental Protection Agency (EPA) lead standard for dust on household floors. At the school, surface lead levels were also very high — about 1,000 times greater than the EPA limit for lead on household floors.

“The high levels of lead we found in children’s blood and throughout the village warranted urgent clinical evaluation and environmental remediation,” said Daniell. “While we had limited to no resources to fund an intervention, we didn’t want to just publish our results with the vague hope that a journal publication would raise attention or prompt change — we felt ethically obligated to follow through. So we hosted a stakeholder workshop to discuss challenges, opportunities, and identify resources to reduce lead exposure in Dong Mai.” Representatives from local, provincial, and national government; healthcare and academic institutions; and non-government organizations (NGOs) attended the December 2012 stakeholder workshop.

Researchers use an X-ray fluorescence analyzer to measure lead concentrations in a home garden.
(Photo courtesy of Gerry Croteau)

Following the workshop, two NGOs — the Vietnam Center for Environment and Community Development (CECoD) and Pure Earth, formerly called the Blacksmith Institute – partnered with the Vietnam Environment Administration (VEA) to develop and implement an intervention plan. The plan involved a community education campaign and environmental remediation.

Remediation activities included intensive cleaning in contaminated houses using HEPA high filtration vacuuming and wet wiping to capture and eliminate lead contaminated dust. In houses where home-based recycling activities occurred in the past, contaminated soil was either capped with tile or with clean soil over a geotextile barrier. The educational campaign provided families with information to reduce lead exposures, such as using wet mopping rather than sweeping to avoid stirring up lead contaminated dust, wiping feet on a mat before entering the home, hand washing, and removing work clothes. UW and NIOEH served as advisors during development of the educational campaign.

As part of a 2013-2014 follow-up study to evaluate the effectiveness of the intervention, the UW-NIOEH research team measured child blood lead levels pre- and post-intervention and found substantial blood lead reductions. According to Daniell, children with blood lead levels of 45 micrograms per deciliter or higher before the intervention experienced an average drop of 20 micrograms per deciliter over the nine-month intervention period. NIOEH continues to monitor progress in the village.

At a 2014 workshop, the intervention process and evaluation results were presented to Vietnam government officials. “The true stars at the workshop were CECoD, VEA, and Pure Earth, who organized the intervention, and the local residents — we simply evaluated the intervention,” explained Daniell. “But it was very encouraging to see government representatives excited about the successful intervention and engaging in discussions about how to further reduce exposures in Dong Mai and villages across Vietnam where similar operations are occurring.”

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