The Environmental And Health Impacts Of Lead Battery Recycling

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Global Lead Poisoning Epidemic

- The World Health Organization estimates that 240 million people are overexposed and 99% of those with blood levels above 20 µg/dl are in the developing world.
- Lead exposures account for 853,000 deaths annually vs. 852,000 for all other occupational risk factors (or 1.1 million AIDS related deaths).
- Greatest burden is in low and middle income countries.
### Are Elevated Blood Lead Levels (BLLs) Still A Problem?

<table>
<thead>
<tr>
<th>Country</th>
<th>Author/Year</th>
<th>Mean BLL μg/dl</th>
<th>% greater than 10</th>
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</thead>
<tbody>
<tr>
<td>India</td>
<td>Kalra et al., 2013</td>
<td>5.3</td>
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<tr>
<td>China</td>
<td>Xie et al., 2013</td>
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<td>South Africa</td>
<td>Naicker et al., 2013</td>
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<td>Democratic Republic of Congo</td>
<td>Tuakuila et al., 2013</td>
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<td>Thailand</td>
<td>Swaddiwudhipong et al., 2013</td>
<td>9.8</td>
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<td>Saudi Arabia</td>
<td>El-Desoky et al., 2013</td>
<td>5.2</td>
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<td>Nigeria</td>
<td>Ugwuja et al., 2014</td>
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<tr>
<td>China</td>
<td>Hou et al., 2013</td>
<td>8.8</td>
<td>NA</td>
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<tr>
<td><strong>Mean</strong></td>
<td></td>
<td><strong>7.5</strong></td>
<td><strong>30.0</strong></td>
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<tr>
<td><strong>USA</strong></td>
<td><strong>NHANES 2010/GM</strong> 1.3 ug/dl</td>
<td><strong>NA</strong></td>
<td><strong>0.8</strong></td>
</tr>
</tbody>
</table>
Why Are Developing Countries More Susceptible To Lead Poisoning?

• More opportunities for exposure.
• Poor nutrition increases lead absorption.
• Higher proportion of children.
• Lack of infrastructure for battery collection and recycling.
• Few regulations on lead industries.
• Absence of health screening programs.
LEAD POISONING

Children with Low Level exposures:
- IQ deficits, lower school performance, lower scores on standardized tests,
- Behavior problems,
- Hearing deficits,

Adults:
- High blood pressure linked to heart disease and stroke;
- Reproductive system effects include miscarriages, preterm deliveries, low birth weight, miscarriages, & stillbirths.
Economic Costs Of Childhood Lead Exposure In Low and Middle-income Countries

- Total cost of $977 billion dollars per year in low- and middle-income countries.
- Economic losses estimated at $134.7 billion per year in Africa or 4% of gross domestic product (GDP).

Source: Attina TM, Trasande L. 2013. Economic costs of childhood lead exposure in low- and middle-income countries. Environ Health Perspect 121:1097–1102; http://dx.doi.org/10.1289/ehp.1206424
Recent Actions on Lead Poisoning Prevention

• In 2012 U.S. CDC eliminated the “level of concern” for children of 10 μg/dl and instead adopted a reference value approach (currently >5 μg/dl);
• U.S. CDC/NIOSH 2015 changed the case definition for adults to level ≥5 μg/dL (“nationally notifiable condition”).
• California updating occupational lead standard and proposed changing the airborne lead PEL from 50 μg/m³ to 2.1 μg/m³ (with goal to keep workers blood lead level below 10 μg/dl).
Global Mined Lead Production (1995-2014)

http://minerals.usgs.gov/minerals/pubs/commodity/lead/
Lead Battery Recycling
California Lead Battery Recycling Plant Ordered To Close

- Lead battery recycling plant outside Los Angeles ordered to close in 2015.
- Exide agreed to spend at least $47 million dollars on cleaning up the site and contaminated properties up to 3 km away!
- Actual cleanup cost may exceed $500 million dollars.
Lead Battery Manufacturing

Welding battery plates together by melting lead with an open flame.

Lead Air Emissions From Recycling Facilities Reporting To Mexico, Canada and U.S. (2010)

- Quemetco, Inc. Indianapolis, Indiana (110,000 metric tons/year capacity)
- Tonolli Canada, Mississauga, Ontario (70,000 metric tons/year capacity)
- Recicladora Industrial Acumuladores, Santa Catarina, Nuevo Leon (110,400 metric tons/year capacity)
Average blood lead level in manufacturing plants was 47 ug/dl and 64 ug/dl in recycling facilities; average air lead level was 367 ug/m\(^3\) or 7 times U.S. OSHA permissible level; geometric mean blood level among children living near plants: 19 ug/dl.

Soil Lead Levels at African Lead Battery Recycling Plants

• Ongoing study by OK International’s partners in 7 African countries (including Nigeria, Cameroon, Ghana, Kenya, Mozambique, and Tunisia);

• Soil sample results (to date) in locations outside of lead battery recycling plants range from < 40 ppm to 140,000 ppm (14%);

• 81% of the soil samples analyzed to date have lead levels greater than 80 ppm and 64% have soil lead levels greater than 400 ppm.
Why Must We Act Now?

• Lead battery consumption is growing.
• Few countries in Africa regulate the lead battery recycling industry.
• There are very few recycling plants with adequate emission controls.
• It will cost billions of dollars to deal with the legacy of lead contaminated soil and resulting poisoning cases unless we address this now!
Response Needed

• UN Agencies, the global health community and foundation funders should respond to this challenge;
• Build capacity for blood lead testing and health programs in all countries;
• All governments to require collection or take back programs for used lead batteries;
• Governments to mandate environmental and occupational standards for lead battery manufacturing and recycling industries.
“You will observe with Concern how long a useful truth may be known, and exist, before it is generally received and practiced on.”

Benjamin Franklin
“Letter on Lead Poisoning”
July 31, 1786
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