

## A CHINA ENVIRONMENTAL HEALTH PROJECT RESEARCH BRIEF

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### **Growing up in a Leaded Environment: Lead Pollution and Children in China**

By Debbie Lee with research assistance from Jing Chen

In 2007, it seemed that practically every few weeks, there was a report of a Chinese import being recalled because it contained a dangerous ingredient or was tainted with lead. There was lead in the paint of children's toys and in play jewelry. In early 2008, lead was found in children's sunglasses imported from China. Understandably, American consumers were worried about the effect lead in products could have on their children, but little discussion was raised on the impact lead could be having on children in China. If lead was in the final product in America, then it was most definitely in the production process in the country of origin. Besides emissions from toy and other industries, China is facing considerable lead pollution from smelters and potentially lingering health impacts from lead in auto exhaust.

#### **Lead Causes Harm**

There is no specific contamination route for lead. Humans can intake lead by breathing it in or consuming it in liquids or food. The current World Health Organization's (WHO) "safe" limit for lead in blood, originally set in 1995, is 10 micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ). Yet there is no detectable safe blood lead level—at every measurable level of lead, there is associated harm. Lead has been linked to drops in IQ points, behavioral problems, and Attention Deficit Hyperactivity Disorder (ADHD). Lead exposure can also cause anemia, damage to the gastrointestinal tract, and kidneys. Chronic exposure can even lead to DNA damage.<sup>1</sup> While also dangerous to adults, it is especially harmful in young children because it negatively affects their cognitive and nervous system development. High levels of lead exposure can cause stunted growth in children, severe brain damage, mental retardation, and even death. Children also absorb more lead from the environment because they, per pound, eat, drink, and breathe more than adults. Lead poisoning is a prevalent problem around the world, especially in developing countries including China. Studies have consistently shown that Chinese children have much higher blood lead levels (BLL) than even the WHO's "safe" limit.

#### **Sources of Lead in China**

Over the past decade China has been tightening regulations controlling the use of lead. Lead standards for fertilizers were passed in 2002, and for food in 2004. Leaded gasoline was also prohibited in 1999. In September 2007, China also signed an agreement with the United States to ban the lead paint in the manufacture of toys and to address other product safety issues. Despite the tightened regulations, implementation and enforcement are lagging.<sup>2</sup> Even though China banned the production of leaded gasoline in 1999, phasing it out in major cities through the early 2000s, it is still available, especially in the western provinces.<sup>3</sup> Besides leaded gasoline, lead is also heavily prevalent from other sources, such as coal-burning, smelting factories, lead paint, and residual use of leaded gasoline. Fully eliminating leaded gasoline will reduce BLLs, but an October 1999 report in *China Medical Journal* showed that the BLL of Shanghai children did not drop as much as expected after the leaded gasoline phase out, suggesting that additional lead emissions from industrial sources also need to be addressed.<sup>4</sup> Lead also naturally occurs in the environment, and China is the global leader in mining and producing lead.<sup>5</sup>

Another source of lead is the e-waste recycling industry. Despite the Basel Convention of 1989, in which countries agreed to restrict the transboundary movement of hazardous waste, e-waste from developed countries still finds its way into China and other Asian countries for dismantling. The United States is the only developed country that has not ratified the Basel Convention, and developed countries that have ratified the Basel Convention continue to export their computer and electronic waste to China. On China's end, enforcement on e-waste imports is incomplete at best. There are towns in Southern China, such as Guiyu whose main source of economic income is processing e-waste. In Guiyu 60 to 80 percent of families carry out e-waste recycling in small-scale workshops. A study published in July 2007 found that over 80 percent of Guiyu children tested had BLL greater than 10 µg/dL, more than double the percentage of children tested in a neighboring non-e-waste recycling town.<sup>6</sup> (For more information see "High Tech's Toxic Legacy in China" in *China Environment Series 9* and "China as E-Waste Dumping Ground: A Growing Challenge to Ecological and Human Health.")

### High Blood Lead Levels in Chinese Children

In August 2006, long unchecked emissions from a smelting plant in Huixian County of Gansu Province in northwest China sickened thousands, of which 334 children were found to have excessive lead in their bloods and among them 62 were confirmed to suffer from lead poisoning.<sup>7</sup> An unpublished study by researchers with the Chinese Medical Association noted that of the 11,348 schoolchildren tested in Shenzhen, 65 percent had an "unsafe" BLL above 10 µg/dL.<sup>8</sup> The majority of studies in China have focused on the BLL of children in individual provinces and cities. A literature review carried out by researchers in Beijing of 1994-2004 studies attempted to achieve a greater understanding of trends throughout the country. One of the review's findings was that children living in urban or industrial areas have significantly higher BLL than those living in rural areas.<sup>9</sup> (See Table 1).

Table 1. Comparison of BLL of Chinese Children Based on Location

Makeup	BLL (µg/dL)
Industrial	110.1 µg/dL
Urban	95.4 µg/dL
Suburbs or Rural	89.8 µg/dL

Source: Shunqin Wang and Jinliang Zhang, 2006, "Review: Blood lead levels in children, China," *Environmental Research* 101: 412-418.

Lead notably persists in the environment and can bioaccumulate in bodies, with effects long after the initial source of lead is gone. Thus, even if China were to completely stop using lead tomorrow, lead has long-term implications beyond a drop in IQ points. Recent studies indicate that increased mental deterioration may be linked to lead exposure decades prior.<sup>10</sup> Lead exposure today or in the past can cause the loss of potential economic gain because of cognitive impairment for individuals who have been exposed. This in turn has a trickle-up effect on the nation's educational and economic capital as a whole.

But the situation may be getting better. Experts believe that children's BLL will begin to decrease over time as China continues to clean up its environment, invest in and develop cleaner technologies, and improve enforcement.<sup>11</sup> A study presented by Zhang Yanfeng of the Capital

Institute of Pediatrics in Beijing presented at the International Conference on Children, Health, and the Environment in 2007 provides some evidence of the positive trends. The researchers sampled blood of children ages 0-6 in 14 Chinese cities over the span of three years, beginning in 2004. While there was no statistically significant difference between the average BLL from year to year (with a geometric mean of 46.89µg/L), there was a significant drop in the prevalence of elevated BLL ( $\geq 100\mu\text{g/L}$ ).<sup>12</sup> (See Tables 2 and 3)

**Table 2.**  
**Average BLL of Children ages 0-6**  
**Tested**

Year	BLL (µg/L)
2004	47.42
2005	46.17
2006	47.03

*Note: Not statistically different.*

**Table 3. Percent Children 0-6**  
**Tested with Elevated BLL ( $\geq$**   
**100 µg/L)**

Year	Percent
2004	9.91
2005	7.78
2006	7.35

*Note: Statistically different ( $p < 0.05$ ).*

*Source:* Zhang Yanfeng, “Blood Lead Level of Chinese Children (0-6 years old),” presented at International Conference on Children, Health, and Environment, June 2007, Vienna.

There is a great need for a national study to understand how widespread and serious lead contamination is in China’s environment and to what degree it is affecting human health (particularly children). The 2006 Beijing literature review attempted to do so, but it relied solely on individual studies carried out in very limited geographic areas. In the 1990s, the U.S. Environmental Protection Agency did work with its Chinese counterparts on studies of lead in children in China and undertaking study of the national picture of lead exposure would provide the basis for a national strategy to attempt to mitigate the problem.

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<sup>1</sup> Thuppil Venkatesh, “Effect of Environmental Lead on the Health Status of Women and Children in Developing Countries,” presented at the International Conference on Children, Health and Environment, June 2007, Vienna. <[http://inchesnetwork.net/Lead\\_Venkatesh.pdf](http://inchesnetwork.net/Lead_Venkatesh.pdf)>

<sup>2</sup> David Barbosa, “Why all the lead in Chinese-made goods?” *Taipei Times* 13 September 2007. <<http://www.taipetimes.com/News/editorials/archives/2007/09/13/2003378572>>

<sup>3</sup> Cynthia Washam, 2002, “Lead Challenges China’s Children,” *Environmental Health Perspectives* 110(10): A 567. <<http://www.ehponline.org/docs/2002/110-10/forum.html>>

<sup>4</sup> Washam.

<sup>5</sup> Barbosa.

<sup>6</sup> Xiz Huo, Lin Peng, Xijin Xu, Liangkai Zheng, Bo Qiu, Zongli Qi, Bao Zhang, Dai Han, and Zhonxian Piao, 2007, “Elevated Blood Lead Levels of Children in Guiyu, and Electronic Waste Recycling Town in China,” *Environmental Health Perspectives* 115(7): 1113-1117. <<http://www.ehponline.org/docs/2007/9697/abstract.html>>.

<sup>7</sup> “62 Children Confirmed to Have Lead Poisoning,” *China Daily* October 10, 2006. Online <<http://www.china.org.cn/english/government/183353.htm>>

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<sup>8</sup> Cynthia Washam, "Lead Challenges China's Children," *Environmental Health Perspectives*, Vol. 110, 2002, Online <<http://www.questia.com/googleScholar.qst?docId=5000676662> >.

<sup>9</sup> "Lead pollution by gasoline – a persisting problem," *evisa*, 18 July 2006, Online <<http://www.speciation.net/Public/News/2006/07/18/2228.html>>. Shunqin Wang and Jinliang Zhang, 2006, "Review: Blood lead levels in children, China," *Environmental Research* 101: 412.

<sup>10</sup> Malcolm Ritter, "Lead Linked to Aging in Older Brains," *Associated Press*, 27 January 2007, Online <<http://ap.google.com/article/ALeqM5i2HzspLEIip5vX5M5okbrd3arPKQD8UEBSGG0>>.

<sup>11</sup> Washam.

<sup>12</sup> Zhang Yanfeng, "Blood Lead Level of Chinese Children (0-6 years old)," presented at International Conference on Children, Health, and Environment, June 2007, Vienna. <[inchesnetwork.net/Lead\\_Zhang.pdf](http://inchesnetwork.net/Lead_Zhang.pdf)>