Lead, unsafe at any level

Lead poisoning is a global health problem, whatever the source — leaded petrol, lead-contaminated land, lead-containing cosmetics, lead piping, lead-containing caulking and roofing materials, lead-based paint, lead smelters, lead recycled from car batteries, or lead in ammunition in war zones.

Of these many sources, leaded petrol stands indicted as one of the worst offenders against public health. In countries still fuelling vehicles with leaded petrol, about 90% of the lead in the environment comes from emissions in the form of fine particles that are inhaled and absorbed through the lungs.

The evidence from the US is very strong, says WHO chemical safety expert Dr Jenny Pronczuk. In 1978, the US banned lead from paint, thereby reducing the risk of local exposure in the home, and in 1986, from petrol. Surveys in the US in the early 1980s showed that 88% of children had blood lead levels above the 10 μg/dl lead concentration safety limit that the US Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, established in 1991. (This limit is now being challenged, but is still the universally accepted safety level.) A decade later, when the lead phase-out had taken effect, only 5% of US children had blood levels exceeding the CDC's safety limit.

Not surprising then that there is consensus among international bodies, such as the World Bank, WHO and the UN Commission on Sustainable Development, that countries must give up leaded petrol for the sake of public health. In 1994, the UN commission called on governments worldwide to switch from leaded to unleaded petrol. Yet by the end of 2000, only 42 countries, including China, New Zealand, the US, some Western and Eastern European countries, and several Latin American countries, had phased out or were phasing out lead from petrol. India and a dozen or more countries in Latin America and Western Europe are committed to making the switch by 2005, while the remaining 150 or so countries in the world have still not decided.

Yet there is undoubtedly a need for such a switch, as work by Dr Annette Pruess, from WHO's protection of the human environment department, shows. Pruess is coordinating the work of a team of experts evaluating more than 700 epidemiological and population studies to extract information about the global disease burden from lead. She estimates that about half of urban children under age 5 globally have blood levels exceeding 10 μg/dl. The great majority of cases of lead poisoning, she says, are in the developing world.

In the June 2001 issue of *Environmental Health Perspectives*, for example, Dr Reinhard Kaiser and colleagues from the CDC and the National Institute of Preventive and Social Medicine in Dhaka, Bangladesh, showed that 87.4% of 779 primary-school children aged 4–11 years living in Dhaka had blood levels above 10 μg/dl. Given that poor nutrition makes children more susceptible to lead poisoning, studies such as this are particularly bad news for developing countries.

However, evidence is now emerging that doses even below 10 μg/dl can cause neurological damage. Dr Bruce Lanphear, from the Children's Hospital Medical Center of Cincinnati, reported in April last year to the US Pediatric Academic Societies that IQ declines as blood lead rises in children with concentrations lower than 10 μg/dl. Among the 276 six-month-old children tested for blood lead in his study, there was an 11.1 point average drop in IQ associated with the first 10 μg/dl increase in blood lead concentrations. The decline in IQ continued at concentrations above the 10 μg/dl limit, with children showing a 5.5 point drop in IQ for every subsequent 10 μg/dl increase.

"This indicates that millions more children in the United States than was previously thought endure the detrimental effects of lead exposure," said Lanphear, who is a member of the CDC's lead advisory panel. He says that the message from his work is that no level of lead in the blood is safe and that public health officials need to make primary prevention — removal of lead from the environment — their priority, rather than case management.

His argument is reinforced by a study reported in the *New England Journal of Medicine* (*NEJM*) of 10 May 2001. This was a multi-centre randomized trial in children with blood lead levels between 20 μg/dl and 44 μg/dl, a group that it was hoped might be helped by Succimer, a chelating drug that binds to lead, thereby allowing it to pass through the body. The trial found that the children's blood lead levels did indeed fall, but their performance in a number of cognitive assessments remained below average. The study suggests that the neurocognitive effects of chronically elevated blood lead levels are irreversible.

Commenting, Drs John Rosen and Paul Mushak from the Children's Hospital at Montefiore in New York wrote in an editorial in the same issue of the *NEJM*, "Although Succimer therapy resulted in lower blood lead levels, its failure to reverse neurocognitive deficits ... confirms the need for collective and concerted efforts to prevent lead poisoning in children."

Lanphear notes: "We are still using children like canaries in a mine to tell us if there is lead in their environment." Though he was referring to poor children in sub-standard housing in the US who are exposed to old leaded paint, his words are applicable globally. ■

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How lead weighs on your health

Whatever its source, lead is readily inhaled or ingested in the body and can be found in the blood, in soft tissue and in bones, where it can remain for decades. The element disrupts calcium metabolism, development of chemical communication between neurons in the brain, and cellular activity. There is some evidence of increased susceptibility in Black children.

At worst, lead poisoning kills or causes severe irreversible neurological damage in adults and in children. At relatively low doses, it reduces sperm count, causes spontaneous abortions, anaemia, colic, vomiting, learning difficulties, and behavioural problems. Children are most susceptible because their bodies are still developing and, pound for pound, absorb a higher concentration of lead than adults.

Lead poisoning is insidious, because at blood lead concentrations under 45 μg/dl symptoms are not always overt. Thus, neurological damage may unknowingly be occurring in children and may subsequently emerge as a lower IQ or as learning difficulties or behavioural problems.

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