

The worldwide problem of lead in petrol

Philip J. Landrigan¹

The use of lead as a petrol additive has been a catastrophe for public health. Leaded petrol has caused more exposure to lead than any other source worldwide. By contaminating air, dust, soil, drinking-water and food crops, it has caused harmfully high human blood lead levels around the world, especially in children (1).

Tetraethyllead was first added to petrol in 1922, to improve engine performance. Soon after production began in Bayway, New Jersey, USA, an outbreak of acute neuropsychiatric disease appeared among workers, 80% of whom developed convulsions and five died (2). A brief moratorium was imposed, while plant conditions were improved. Then, despite strong public health warnings, production resumed. By the 1970s, almost all petrol produced around the world contained lead. In the United States alone, annual petrol consumption included almost 200 000 tonnes of lead (3).

Lead is toxic to multiple organ systems; even at low levels previously considered safe, it has been shown through a series of prospective epidemiological studies to produce adverse effects (4). Some of these are clinically evident, while others are discerned only through special testing and are thus defined as subclinical.

The nervous system of the fetus and infant is especially susceptible to lead, which can cross the placenta and penetrate the blood-brain barrier. Lead interferes with neuronal migration, cell proliferation and synapse formation during critical periods of early vulnerability. The consequences are loss of intelligence and disruption of behaviour. Because the brain has little capacity for repair, these effects are permanent and untreatable. The most recent research indicates that lead can damage the infant brain even at blood levels as low as 5 µg/dl (5).

These findings, together with data showing that lead can damage the catalytic converters of cars, have triggered strong governmental action. Nations around the world have begun to ban lead in petrol. Sharp declines in average blood lead levels and in the number of persons with elevated levels have resulted. In the USA, the removal of lead from petrol between 1976 and 1995 resulted in a 90% reduction in

mean blood lead level (6). Similar effects were recorded in Western Europe, Australia, Canada, New Zealand and South Africa (7). In a number of developing countries too, including China, El Salvador, India, Mexico and Thailand, declines in blood lead levels have followed the removal of lead from petrol (8). Nearly 50 nations have now renounced the use of lead in petrol, and more are planning such action in the next five years. Worldwide, unleaded petrol now accounts for 80% of total sales (1). This is a triumph for public health.

The elegant report from Pakistan in this issue of the *Bulletin* (pp. 769–775) describes the current situation in that country. On the negative side, the average blood lead level among children in Karachi is significantly higher than that seen today among children in industrialized countries. This exposure derives from multiple sources, and the authors have done a superb job of tracing them. Their work will guide future prevention. On the positive side, the authors demonstrate that a decline in the use of leaded petrol in Pakistan has resulted in declines in children's blood lead levels. This success is cause for hope.

The technology exists to complete the transition from leaded to unleaded petrol. The success already achieved attests to the feasibility of this changeover (1). Previously, concerns had been raised that lead must be replaced with benzene, a proven cause of leukaemia. Now, however, it has been established that benzene is not necessary (9). Previously too, it had been suggested that leaded petrol was needed for the proper operation of certain cars, especially older ones. But an engineering analysis has shown that this claim is not true (10). Moreover, an economic analysis has found that the costs of removing lead are generally low — less than US\$ 0.02 per litre for most countries (1). And there are economic benefits associated with the protection of both engines and children against lead.

WHO has been a leader in the global effort to remove lead from petrol. The Bangkok Declaration (11), unanimously adopted at an international meeting on children's environmental health convened

earlier this year, called specifically for the removal of lead from petrol. This call resonates with the theme of World Health Day 2003, which is healthy environments for children.

Precaution is the lesson to be learnt from the history of lead in petrol. The worldwide dissemination of tetraethyllead is a classic example of our excessive willingness to adopt a promising but unproven new technology without heed to its possible consequences. We made the same error with chlorofluorocarbon (CFCs), and we are at risk of making it again if we adopt fuel additives containing manganese, a known neurotoxin. For our children's future, we must do better. ■

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¹ Mount Sinai School of Medicine, One Gustave L. Levy Place, Box 1057, New York, NY 10029, USA (email: phil.landrigan@mssm.edu).
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