Lead is one of the best known toxic heavy metals. The level of lead in the blood is a highly reliable biological marker of recent exposure to lead. Elevated blood lead level (10 µg/dl or above) has been associated with toxicity in the developing brain and nervous system of young children, leading to lower intelligence quotient (IQ). According to recent evidence, however, loss of IQ was observed in children with blood lead levels below 10 µg/dl, so prevention activities should be initiated to bring down the levels of lead in the blood to the lowest possible level.

The phasing out of lead from petrol, first in western Europe and later in central and eastern Europe, has resulted in a significant decrease in blood lead levels in children during the last two decades. Industrial emissions are still important local sources of lead exposure in some countries. Since lead was phased out from petrol, other sources of exposure to lead that had previously been ignored have become increasingly significant. It is still necessary to reduce the levels of lead in the blood further because there is no known safe level in children.

An efficient surveillance system, using comparable methods of blood sampling, analysis and data presentation to monitor lead levels in children's blood, is urgently required for the identification and elimination of the remaining sources of exposure to lead and monitoring of the effectiveness of preventive action.

Rationale

Lead is one of the best known toxic heavy metals. The level of lead in the blood is a highly reliable biological marker of recent exposure to lead. Elevated blood lead level (10 µg/dl or above) has been associated with toxicity in the developing brain and nervous system of young children, leading to lower intelligence quotient (IQ). According to recent evidence, however, loss of IQ was observed in children with blood lead levels below 10 µg/dl, so prevention activities should be initiated to bring down the levels of lead in the blood to the lowest possible level.

Fig. 1. Mean blood lead levels (PbB) of children measured in selected European countries, 1991–2006 (age ranges in years)

Bulgaria 6–15 2003
TFYR Macedonia 10–14 2001–2003
TFYR Macedonia 10–14 2004
Romania 1–9 1999–2000
Russian Federation 2–6 1997
Poland 2–7 1993–1999
Hungary 4–6 1996
Hungary 4–6 2006
Czech Republic 8–11 1996–2001
France 1–6 1995–1996
France 0.5–6 2002–2004
Israel 1–10 1998–2000
Germany 6–14 1990–1992
Germany 3–14 2003–2006

Note. TFYR Macedonia = The former Yugoslav Republic of Macedonia.
Bulgaria 2003: data represent traffic.
(see Assessment section below; third paragraph).
Data for Bulgaria (2003), the Czech Republic and The former Yugoslav Republic of Macedonia are arithmetic means.
Source: Country case studies (4–15).
Figure 1 shows average levels of lead in children’s blood in 11 countries (Bulgaria, the Czech Republic, France, Germany, Hungary, Israel, Poland, Romania, the Russian Federation, Sweden and The former Yugoslav Republic of Macedonia) at different times between 1990 and 2006. This array of data was used due to the paucity of recent data, to allow data from many countries to be considered and to provide some indication of trends. Where possible, average blood lead levels are given as the geometric mean as the distribution of blood lead levels is generally log-normal.

Lead in the environment has multiple sources (e.g. petrol, industrial processes, paint, solder in canned foods, water pipes) and reaches people via a number of pathways (such as air, household dust, street dirt, soil, water, food). As a consequence, evaluation of the relative contribution of different sources is complex and is likely to differ between areas and population groups. Lead-containing petrol remains the most important source of atmospheric lead and is a significant contributor to the lead burden in the body in the countries where it is still used. Industrial emissions are also important sources of lead contamination of the soil and ambient air. Lead from atmospheric air or flaked paint deposited in soil and dust may be ingested by children and may substantially raise their blood lead levels. In addition, food and water may also be important media of baseline exposure to lead (2). In children, the potential for adverse effects of exposure to lead is increased because (i) the intake of lead per unit of body weight is higher for children than for adults; (ii) young children often place objects in their mouths, as a consequence of their Disposal recognize the need for international chemicals management goes a step further in committing the parties to ensuring that chemicals are produced and used in ways that minimize significant adverse impacts on the environment and on human health (21). In addition, international commitments are made that specifically address the exposure of children to lead. In February 1996, the environment ministers of the Organisation for Economic Co-operation and Development (OECD) issued a Declaration on Lead Risk Reduction seeking voluntarily to develop and strengthen national and cooperative efforts considered necessary to reduce the risks from exposure to lead. Their goals include efforts to phase out leaded gasoline and eliminate the exposure of children to lead (22).

The 1997 Declaration of the Environment Leaders of the Eight on Children’s Environmental Health commits the G8 countries to fulfill and promote internationally the OECD Declaration on Lead Risk Reduction. They specifically called for further action to reduce the levels of lead in children’s blood to below 10 µg/dl. When this level is exceeded, further action is required. They agreed to conduct public awareness campaigns on the risks to children from exposure to lead and to develop scientific protocols and programmes to monitor the levels of lead in children’s blood to track progress in this important area (23).

In September 2006, the Intergovernmental Forum on Chemical Safety was the setting for the Budapest Statement on Mercury, Lead and Cadmium, which recognizes that the risks from these three substances need to be addressed by further global, regional, national and local action, as appropriate (24). In the same context, the Declaration of Brescia on Prevention of the Neurotoxicity of Metals supported the revision of lead exposure standards and promoted an immediate reduction of the level of lead in children’s blood to a concentration of 5 µg/dl worldwide (25). This level is proposed as a temporary measure that may need to be revised further downwards in future years as new evidence accumulates on toxicity at still lower levels of lead in the blood.

In 2004, the Fourth Ministerial Conference on Environment and Health adopted the Children’s Health and Environment Action Plan for Europe (CEHAPE), which includes four regional priority goals to reduce the burden of environment-related diseases in children. One of the goals (RPG IV) aims to reduce the risks of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (such as excessive ultraviolet radiation) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence. In CEHAPE RPG IV specific action is set out to reduce the exposure of children to lead, such as the enactment of
legislation on the content of lead in petrol and building materials, to develop and enforce regulations to minimize the risks from hazardous building materials (such as lead) and to carry out biomonitoring of lead in infants and mothers at risk (26).

**EU context**

The Seventh Research Framework Programme (2006–2013) of the EU emphasizes the development of a coherent approach to human biomonitoring, which is necessary to assure appropriate risk assessment and management for chemicals that influence human health (27).

In 1977, Council Directive on Biological Screening of the Population for Lead (77/312/EEC) committed the EU member states to apply a common procedure for biological screening in order to assess the exposure of the population to lead outside the working environment (28). Several European policy initiatives on reducing the amount of leaded petrol (the main source of elevated levels of lead in children’s blood) are in place in the member states. The Fourth Ministerial Conference “Environment for Europe” in June 1998 endorsed the United Nations Economic Conference “Environment for Europe” in June 1998, which resulted in an action plan to phase-out leaded petrol by the year 2001 (29). The WHO has made recommendations for national action plans to phase-out leaded petrol (30) and to develop measures to prevent exposure of children to lead (31). The EU has also adopted legislative measures to minimize the risk from hazardous building materials (such as lead) and to carry out biomonitoring of children’s blood (32).

**Screening of the Population for Lead**

In 1977, Council Directive on Biological Screening of the Population for Lead (77/312/EEC) committed the EU member states to apply a common procedure for biological screening in order to assess the exposure of the population to lead outside the working environment (28). Several European policy initiatives on reducing the amount of leaded petrol (the main source of elevated levels of lead in children’s blood) are in place in the member states. The Fourth Ministerial Conference “Environment for Europe” in June 1998 endorsed the United Nations Economic Conference “Environment for Europe” in June 1998, which resulted in an action plan to phase-out leaded petrol by the year 2001 (29). The WHO has made recommendations for national action plans to phase-out leaded petrol (30) and to develop measures to prevent exposure of children to lead (31). The EU has also adopted legislative measures to minimize the risk from hazardous building materials (such as lead) and to carry out biomonitoring of children’s blood (32).

**Method of calculating the indicator**

As the data were provided in various forms and for various time periods and age groups, it was not possible to do a meta-analysis. In the case of Romania, geometric mean was estimated on the basis of frequency distribution among blood lead level categories. **Geographical coverage**

Bulgaria, the Czech Republic, France, Germany, Hungary, Israel, Poland, Romania, Russian Federation, Sweden and The former Yugoslav Republic of Macedonia. **Period of coverage**

1991–2006. **Frequeny of update**

None.

**Data quality**

The accuracy and precision are high for measurements of lead in the blood reported by the countries, regardless of different methods of analysis. All samples were analysed by laboratories participating in international proficiency programmes. Only the report from Germany for 2003–2006 was based on representative samples of the population in one part of the country. Other data presented in this fact-sheet are specific to the areas, time of the study and the given age groups. Comparison of the data over time and between countries should, therefore, be made with extra caution. Harmonized methods of blood sampling, analysis and data presentation with improved comparability are needed in the future for monitoring the level of lead in children’s blood.
References:


Further information

UNICEF


Fifth Session of the Intergovernmental Forum on Chemical Safety.


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