

Outbreak of lead intoxication in Thiaroye sur Mer, Senegal

WHO support mission,

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Executive summary

Following an unexplained cluster of deaths between November 2007 and February 2008 in children from the NGagne Diaw neighbourhood of Thiaroye sur Mer, Dakar, Senegal, investigations by health and environmental authorities revealed that the area was contaminated with lead from the informal recycling of lead batteries. In addition, siblings and mothers of the deceased children were found to have very high blood lead levels, in many cases above 1000 µg/L. Following these findings, in March 2008 the Senegalese Ministry of Environment removed 300 tons of battery waste and contaminated soil and covered the area with clean sand.

Lead is a cumulative toxin that affects multiple body systems, including the neurological, haematological, gastrointestinal, cardiovascular and renal systems. Children are more vulnerable to the harmful effects of lead than adults. The adverse health effects range from death to impaired cognitive and behavioural development that can have lifelong consequences. In children, blood lead levels < 100 µg/L are already associated with cognitive impairment, levels above 450 µg/L require chelation therapy, levels over 700 µg/L constitute a medical emergency requiring immediate treatment, and levels above 1200 µg/L are considered acutely life-threatening.

Following a request from the Senegalese authorities, WHO deployed an international team consisting of a clinical toxicologist, an environmental health specialist and an analytical chemist to assist the Senegalese Ministry of Health and Prevention to: a) provide further medical assessment and support treatment for affected cases, b) further investigate the health risks related to lead contamination in the affected community and provide recommendations on how to mitigate those risks, and c) strengthen local awareness and capacities for the prevention, treatment and management of lead exposures and intoxications.

Medical examinations performed on 55 siblings and mothers (32 children and 23 mothers) of deceased children confirmed continuing high blood lead levels ranging from 383 to 3454 µg/l. These concentrations represent a very serious risk to health, both short and long term. In addition, evidence of neurological damage, some of which may be irreversible, was observed in the majority of children examined. Furthermore, of the 32 children whose blood lead was measured in the earlier investigation, 12 showed increased concentrations, indicating continuing exposure.

Further medical investigations on 25 randomly selected members of the community also revealed high exposure to lead, including among people who had never been involved in lead recycling and/or extraction activities. Blood lead levels ranged from 363 to 6139 µg/l. In addition, several cases, showed severe neurological disorders. These findings raise concerns that the whole population of NGagne Diaw, estimated at 950 inhabitants, might be intoxicated by lead.

Environmental investigation found that the whole quarter of NGagne Diaw was heavily contaminated by lead as a result of informal lead recycling and extraction activities. Lead concentrations up to 30% were measured outdoors, while concentrations up to 1.4 % were measured indoors. These grossly exceed the French guideline value for residential areas of 0.04% lead. Currently, environmental contamination seems to be limited to this quarter, which has an area of about 350 m by 200 m.

Site visits and interviews revealed that informal lead battery recycling had been taking place since about 1995 on an open area of land in the middle of NGagne Diaw. Over the years this has resulted in extensive lead contamination of the soil. However, towards the end of 2007, lead battery recycling intensified and, in addition, people started to transport contaminated soil from the recycling area to other areas in the quarter to sieve it and extract lead parts. Enriched soil was then packed into bags and stored inside homes to be sold later to a local business man. Children were seen to play with this contaminated soil. These activities resulted in a massive environmental contamination both indoors and outdoors, and, through inhalation/ingestion of contaminated dust and hand-to-mouth behaviour of small children, in a considerable human exposure to lead for the whole community.

Clean-up operations conducted by the Ministry of Environment in March 2008 contributed to temporarily reducing lead exposure of the population in the area. However, measurements subsequently conducted in the field clearly demonstrated that lead contamination had spread again from untreated areas as a result of daily activities by inhabitants and from the effect of local wind.

Based on these findings, WHO presented the following urgent recommendations to the Senegalese Ministry of Health: 1) Lead exposure of the population living in the NGagne Diaw neighbourhood, in particular small children, should be stopped as soon as possible; 2) Children already identified with blood lead levels above 450 µg/L should receive chelation therapy and other appropriate medical treatment. Priority should be given to those with life-threatening blood lead levels and/or neurological symptoms; 3) A systematic screening of the health status and blood lead levels of all inhabitants of the NGagne Diaw neighbourhood should be undertaken to identify those in need of chelation therapy; 4) A communication strategy should be put in place to inform the population of NGagne Diaw and the public about the health risks from exposure to lead and appropriate risk mitigation measures; and 5) Effective coordination should be ensured between all Ministries whose involvement is required to deal with this public health and environmental emergency.

In the longer term, WHO also recommends that: 1) Continued medical follow-up for the affected population, in particular for children, should be ensured; 2) Technical expertise should be sought on the best approach to managing the environmental contamination in order to prevent further human exposure to lead; 3) Contaminated soil removed from NGagne Diaw should be handled and treated according to international standards; 4) The possible contamination of groundwater, in particular with lead, arsenic and antimony, should be investigated; 5) Other sites in Senegal where informal lead recycling activities are taking place should be identified and evaluated to prevent the occurrence of similar public health emergencies; 6) A long-term national strategy for the sound management of used lead-acid batteries should be developed in coordination with relevant Ministries, taking into account socio-economic aspects.