

Lead in Drinking Water in Slovenian Kindergartens and Primary Schools

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OBJECTIVES

Exposure to lead from the environment is an important public health problem. In the early ages of a child's life, it may cause permanent neurological and psychological changes. The International Agency for Research on Cancer has determined that inorganic lead is probably carcinogenic to humans (Group 2A).

Lead is most often found in water when water comes into contact with public or domestic water supply systems that contain lead pipes, taps, solder or other plumbing components. The average contribution from lead in drinking water is estimated to be 7 % of the total input from the environment. The contribution in children is about twice as great.

The purpose of the work is to determine concentration levels of lead in drinking water in older Slovenian kindergartens and primary schools.

METHODS



To determine the concentrations of lead in drinking water in kindergartens or schools, a sample of 250 ml of drinking water that stood in the pipes from 8 to 18 hours is required. The first draw sample has to be taken from the kitchen where food and drinks are prepared.

After the first sample, a follow-up (flush) sample has to be taken. Before that, the water has to run for 30 seconds.

In the laboratory, ICP-MS method was used to determine the concentration of lead in water; colorimeter was used for measuring free chlorine; for redox potential and pH values MultiLine P4 with a combined electrode SenTix ORP or SenTix 41-3 with temperature sensor were used.

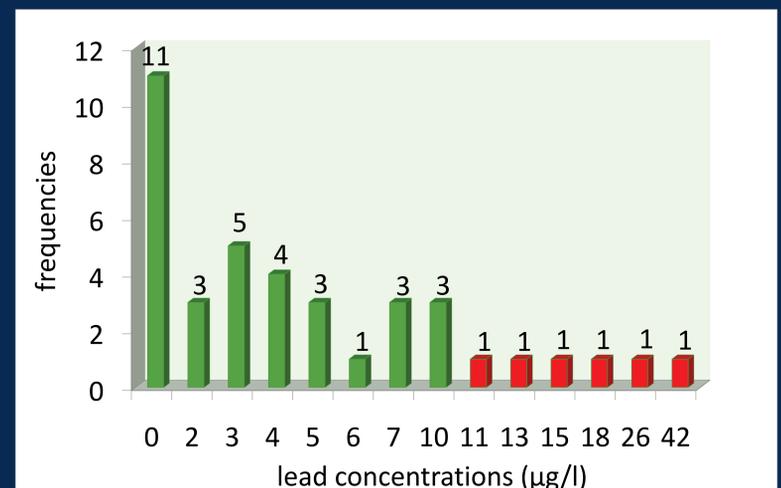
LITERATURE CITED

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RESULTS

Thirty-nine (39) old kindergartens and schools were selected; most institutions were built prior to 1980. An analysis of the samples showed that 6 samples out of 39 had levels of lead higher than 10 $\mu\text{g/l}$, three samples had lead concentration at the level 10 $\mu\text{g/l}$, and two concentrations in samples highly exceeded that. Negative correlation between the level of pH and concentration of lead in drinking water was moderate and confirmed the assumption that lower pH water results in higher concentration.

Figure 1: Frequency distribution of lead concentrations measured in selected kindergartens and schools in Slovenia



The exposure to lead in drinking water for a 6-year-old child, who weighs app. 20 kg and drinks 1.2 liters of water per day, has been calculated, assuming that the proportion of the input of lead through drinking water is 50 %. In case that the child drinks the water with the highest measured concentration of lead in our study (i.e. 42 mg / l), the exposure is 17.64 mg / kg body weight, which exceeds the PTWI for lead in drinking water which is 12.5 mg / kg body weight.

DISCUSSION



The study exposes the problem of elevated concentrations of lead in drinking water found in older kindergartens and primary schools. All concentrations of lead after flushing the pipes were below 10 $\mu\text{g/l}$, which shows that the most effective and expeditious action to lower the concentrations of lead in drinking water is flushing the water pipes for a few minutes.

Sampling should be repeated in summer because water temperatures can get higher even by 10°C and the concentrations of lead in drinking water can be doubled.

For the purposes of national monitoring of drinking water it is necessary to apply a new method for determining lead levels in drinking water, for example: sampling of water that stood in the pipes for at least 8 to 18 hours.

FOR FURTHER INFORMATION

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