

INTERNATIONAL INTERLABORATORY COMPARISON OF LEAD AND
CADMIUM DETERMINATION IN SAMPLES OF SUSPENDED
PARTICULATE MATTER

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Equal parts of six real samples of suspended particulate matter were analysed for lead and cadmium by laboratories in three different countries. The results agreed very well. The agreement is encouraging considering queries that arise when results in international projects are compared.

Key terms: air pollution, human exposure, quality control

Interlaboratory comparison of results of lead and cadmium determination in samples of suspended particulate matter (SPM) was initiated on an international level taking advantage of collaboration between institutions from several countries in the WHO/UNEP project on Human Exposure Assessment in various locations (HEALs). The collaboration concerned lead and cadmium studies in the pilot phase of the project. The following institutions were involved: Yokohama City Institute of Health in Yokohama, Japan (YCIH), Air Research Laboratory in Nyköping, Sweden (ARL), Environmental Research Center, University of Nevada in Las Vegas, USA (ERC) and the Institute for Medical Research and Occupational Health University of Zagreb in Zagreb, Croatia (IMROH). This was in addition to the quality assurance control exercise with spiked filters and settled dust, incorporated in the project and organized by the Institute of Environmental Medicine, Karolinska Institute in Stockholm, Sweden, as a Technical Coordination Center for lead and cadmium (1).

It has been shown earlier that instead of using an entire filter with the SPM sample for analysis of metals (2), an aliquot of a filter may be used without committing a statistically significant error (3). Therefore equal parts of six samples were sent to the cooperating laboratories for analysis to estimate the goodness of agreement in the results obtained.

EXPERIMENTAL

Samples of suspended particulate matter were collected in a residential area, four metres above the ground level and three metres off the street. Three samples were collected in a zone with high traffic density and three in another zone where traffic was low.

Samples were collected on membrane filters (Sartorius 11302 100 mm and 3 µm pore size) at a rate of about 150 m³/24 h. After sampling, filters were conditioned to a constant humidity, weighted and then cut into eight equal parts. Two eighths of each filter were handed over to the representatives of YCIH, ARL, ERC and one set was analysed in IMROH. All samples were analysed by atomic absorption spectrophotometry. Results were obtained from three laboratories (YCIH, ARL and IMROH).

RESULTS AND DISCUSSION

The results from the three laboratories are shown in Figure 1 for lead and in Figure 2 for cadmium. The instrument used by IMROH was not sensitive enough to measure cadmium concentrations below 0.01 µg/ml of analysed solution with acceptable precision. Under the experimental conditions applied this corresponded to 0.001 µg/m³ of air. Therefore data for samples 222, 223 and 225 were not available.

The overall correlation between the results for the cuttings of the same sample was very good with all laboratories.

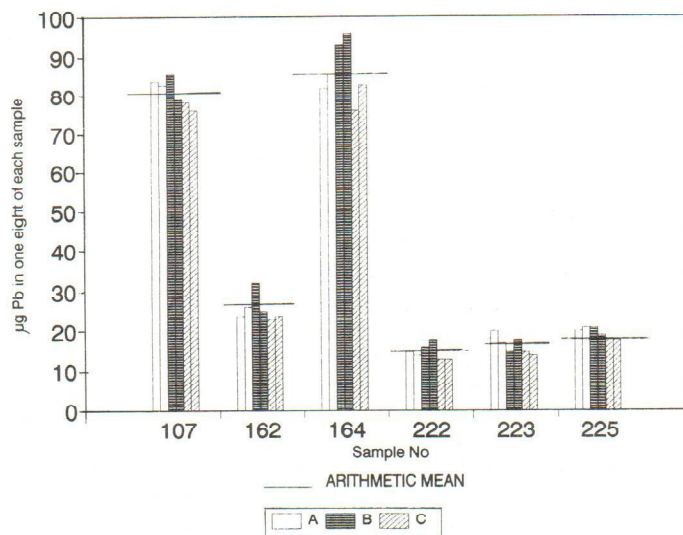


Figure 1. Results of lead determination in equal parts of the same sample by YCIH, ARL and IMROH

The slightly lower results for lead obtained systematically by IMROH as compared to the results of the two other laboratories (and the results for cadmium in the same cuttings) may be attributed to a slight difference in the concentration of standard solutions.

The variability of the results was partly caused by small differences in cuttings. This was also observed when all the parts were analysed in the same laboratory (3). Also, the dispersion of the results from ARI. was a little higher than of those from the two other laboratories. The number of results was too small for any further statistical analysis to lead to a meaningful conclusion. However, the differences and variations mentioned are obviously of little practical importance and the data presented show a very good agreement between the three laboratories. This is encouraging considering queries that arise when comparing results in international projects.

The cooperation of the participating laboratories is very much appreciated.

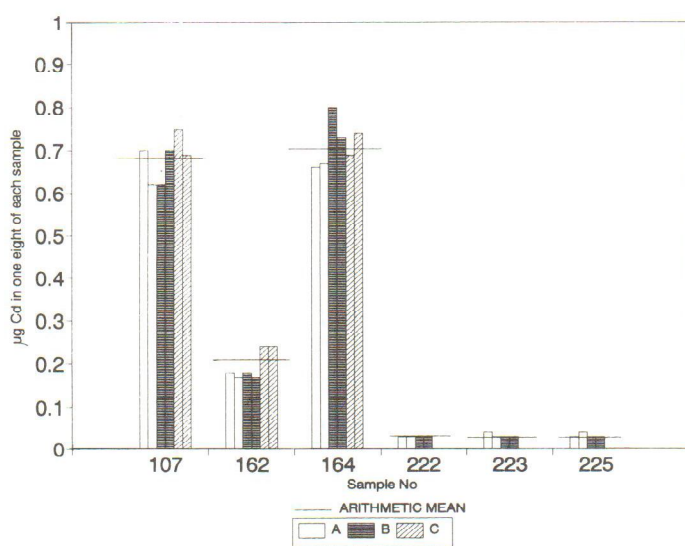


Figure 2. Results of cadmium determination in equal parts of the same sample by YCIH, ARL and IMROH.

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Sažetak

MEĐUNARODNA USPOREDBA REZULTATA ODREĐIVANJA OLOVA I KADMIJA U
UZORCIMA LEBDEĆIH ČESTICA

Šest uzoraka lebdećih čestica podijeljeno je na jednake dijelove i analizirano na sadržaj olova i kadmija u laboratorijima triju različitih zemalja. Rezultati su se vrlo dobro slagali, što je važno pri usporedbi rezultata u okviru međunarodne suradnje.

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Ključne riječi: izloženost ljudi, kontrola kvalitete, onečišćenje zraka