AIR AND BLOOD OCCUPATIONAL EXPOSURE LIMITS FOR LEAD AND REPRESENTING RESULTS

Dear Sir,

The paper by Choy et al[1], reported that workers having blood lead levels (BLL) above 50 μg/dL (men) and 30 μg/dL (women) are required to be removed from the exposure. The United States Occupational Safety and Health Administration (OSHA) has also established the 50 μg/dL level for immediate medical removal. However, recent studies[2,3] have reported that health effects have been shown to extend to much lower BLL (>10 μg/dL) with no threshold effect[4]. Therefore, using a value of 50 μg/dL is suggested to be high with a much lower level, say 25 μg/dL, as the more appropriate upper limit.

Choy et al reported one personal and one area sample as a percent of the permissible exposure limit (PEL), which for Singapore is 0.15 mg/m^3 (150 μg/m^3). It is better to report air exposure results in μg/m^3 so they can be compared to standards and other data. Also, the PEL listed is three times that of OSHA (50 μg/m^3) with the suggestion that the Singapore PEL value be lowered. Since only one sample was collected, it is likely that there is a large variation around this value and it may not be a good representative of exposure[5,6].

To best evaluate occupational exposure, it has been recommended that multiple samples be collected and summary statistics (arithmetic and geometric means, standard deviation and geometric standard deviation) be provided[5,6]. Summary values would provide better information for determining potential occupational risk[5,6]. The use of static or area samplers to represent occupational exposure can be misleading in that these results are often lower than personal samples and do not provide, in many cases, a useful estimate of the actual exposure experienced by workers[7]. So, caution should be applied when reporting static samples as a measure of occupational exposure.

Even though the bulk samples are not high, previous reports have shown that even with low percentages of lead, high airborne levels can be generated[6]. Based on this finding, along with high BLL in some job categories, inhalation may be a more important route than presented. However, the importance of ingestion and hygiene as mentioned by Choy et al cannot be ignored.

Yours sincerely,

John H Lange

Envirosafe Training and Consultants
P.O. Box 114022
Pittsburgh, PA 15239
USA

REFERENCES

1. Choy KDKY, Lee HS, Tan CH. Blood lead monitoring in a decorative ceramic tiles factory in Singapore. Singapore Med J 2004; 45:176-80.
2. Telisman S, Pizent A, Jurasovic J, Cvitkovic P. Lead effect on blood pressure in moderately lead-exposed male workers. Am J Ind Med 2004; 45:446-54.
3. Nagyma L, Desi L, Schultz H, Papp A. Consequences of lead exposure of rats during pregnancy, lactation, and poisoning: a combined behavioural and neurotoxicological study. Int J Environ Health Res 1998; 8:121-35.
4. Canfield RF, Henderson CR, Cory-Slechia DA, Cox C, Jusko TA, Lamphear BP. Intellectual impairment in children with blood lead concentrations below 10 ug per decileter. N Engl J Med 2003; 348:1517-26.
5. Lange JH, Thomulka KW. Evaluation of engineering controls for airborne lead exposure during renovation/demolition of a commercial building. Indoor Built Environment 2000; 9:207-15.
6. Lange JH. Airborne exposure and soil levels associated with lead abatement of a steel tank. Tox Ind Health 2002; 8:28-38.
7. Lange JH, Kuhn BD, Thomulka KW, Sites SLM. A study of matched area and personal airborne asbestos samples: evaluation for relationship and distribution. Indoor Built Environment 2000; 9:192-200.

AUTHORS' REPLY

Dear Sir,

A review of the literature showed that American Conference of Governmental Industrial Hygienists[1] recommends a biological exposure index of 30 µg/dL for blood lead based on subclinical health effects such as changes in nerve conduction and renal function which do not constitute definite functional impairment. The United States Occupational Safety and Health Administration Lead Standards[2,3] recommends a level of 60 µg/dL or greater or an average of 50 µg/dL or more for medical removal protection. For the United Kingdom Health and Safety Executive[4], the suspension levels are 60 and 30µg/dL for males and females of reproductive capacity, respectively, and for young persons under 18 years, 50 µg/100ml. The Australian National Standard for the Control of Inorganic Lead at Work[5] requires medical removal if the blood lead exceeds 50 µg/dL. Biological threshold limit values should be reviewed from time to time to ensure that they continue to be protective of the health of exposed workers and are also practical to implement by the industry.

In our analysis of the lead-in-air levels for this factory, a personal and a static sample were taken from the mixing area where higher levels could be expected. Sampling was conducted when the usual work was done so that it would be representative of the average exposure of the worker. Nevertheless, we agree that there are limitations in interpreting small samples and that to give a better representation of the exposure to the workers, more samples would be ideal.

Yours sincerely,

Kenneth David Choy Kwok Yin
Lee Hock Siang
Tan Chuen Hui

Occupational Health Department
Ministry of Manpower
18 Havelock Road #05-01
Singapore 059764

REFERENCES

1. American Conference of Governmental Industrial Hygienists. Documentation of the Biological Exposure Indices. 7th ed. Copyright 2001.
2. Hipkins K, Materna BL, Kosnett M, Rogge J, Cone J. Medical surveillance of the lead exposed worker: current guidelines. AAOHN Journal 1998; 46:330-9.
3. Occupational Safety & Health Administration, US Department of Labour, Medical Surveillance Guidelines – 1910.1025 AppC.
4. The Control of Lead at Work Regulations, UK, 2002. Statutory Instrument 2002 no. 2676.
5. National Occupational Health and Safety Commission. Control of Inorganic Lead at Work: National Standard for the Control of Inorganic Lead at Work (NOHSC:1012(1994)). Australian Government Publishing Service, Canberra, 1994.