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COMPARISON OF AIA AND NIOSH METHODS ON ASBESTOS FIBRE MEASUREMENTS IN THE WORKPLACE

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Abstract—Industrial hygiene evaluation of airborne asbestos dust by the membrane-filter/phase-contrast optical-microscope method has been adopted by most countries, but detailed procedures differ. In the present work sampling results obtained in an asbestos cement factory by the NIOSH Analytical Method P & CAM 239 and the AIA Recommended Technical Method No 1 (adopted as the European standard) have been compared. The concentrations measured by the AIA method were on average less than those determined by the NIOSH method, the mean ratio AIA NIOSH being 0·29. Analysis of variance showed the difference to be statistically significant. Investigations into the source of the difference showed that it arose from the different methods of mounting and evaluating the samples rather than from the methods of sample collection. The fitting of a cowl to the sampling head in the AIA method had no effect. These findings regarding the source of variation are consistent with previous results by the same team using laboratory-prepared samples. However, it appears that the relationship between the methods may not be the same for all workplaces where asbestos is found. The findings of this study have implications not only for comparing fibre concentrations measured by the AIA and NIOSH methods but also for harmonizing environmental standards.

INTRODUCTION

AIRBORNE ASBESTOS fibre concentrations of all types (principally chrysotile) in working environments are generally sampled on membrane-filters and counted by phase-contrast optical-microscopy. This, despite its many limitations, is accepted by most countries as a routine method. Experience has shown that the method does not always produce comparable results when used by different laboratories and by different counters (BECKETT and ATTFIELD, 1974; GIBBS *et al.*, 1977). It is well known that differences can arise owing to variations in sampling, slide preparation and optical counting (BECKETT, 1980; BUSCH *et al.*, 1979; PICKFORD, 1980). Much of the investigation of the inter- and intra-laboratory reliability (WALTON, 1982) of the method has focused on the analytical equipment and methodology. However, to characterize the inherent variability of the entire sampling/analytical procedure, factors such as inter-counter variability and sampling error must be added to the intra-filter variation.

Most countries today are attempting to develop a well standardized method for counting asbestos fibres at workplaces and new regulations for occupational exposures to asbestos are now under consideration by the Commission of the European Communities (CEC) and Occupational Safety and Health Administration (OSHA) as well as International Organization for Standardization (ISO) and American Society for Testing and Materials (ASTM).

Previous studies have investigated the effects of counting rules and aspect ratio on the levels and reproducibility of fibre counts (COWIE and CRAWFORD, 1982; CRAWFORD *et al.*, 1982).

A comparison (GONZALEZ-FERNANDEZ and MARTIN, 1986) between the counting