The twain have met

Oh, east is east and west is west,
and never the twain shall meet
(Rudyard Kipling, 1899)

The twain met in Hawaii in August 1989 to discuss biological monitoring of exposure to industrial chemicals at a United States-Japan cooperative seminar sponsored by the American Conference of Governmental Industrial Hygienists (ACGIH), the Japan Society for the Promotion of Science, and the US Science Foundation. Perhaps it is significant that in Hawaii east becomes west, and vice versa.

The subject they considered, biological monitoring, is one to which many occupational health professionals pay only lip service—rather inappropriate expression for what is still largely a closet science.

The proceedings now published by ACGIH bring together a remarkable set of papers that should concern all workers in occupational health and safety as they cover many facets of the subject. Not only do they enable direct comparison to be made of research and application of biological monitoring in the United States and Japan, but also in Germany and the European Community, thanks to papers by Alessio and by Henschler. Fiserova-Bergerova (Thomas) not only presents a review of history and concepts of biological exposure indices (BEIs), but also compares those established by her ACGIH BEI Committee with the German biological tolerance values for working materials (BAT).

A reviewer of such a volume is faced with a particularly difficult task; does he critically review subjects in his own locus of interest, or try to provide a “balanced” review of the whole work? Here the reader will find information on many facets—scientific, legislative, social—one or more of which may be of interest to a particular person.

Whereas participants came principally from Japan (18) and the United States (23), five other countries were represented, but not the United Kingdom. The monograph groups the 40 papers under headings: concepts, and reference values (six papers); implementation of biological monitoring (10); research reports from Japan (metals five, solvents four); biological monitoring of co-exposure (four); cellular and genetic markers (three); ethnic factors in the United States and Japan (four); technical issues (two). This listing alone should intrigue readers sufficiently for them to wish to consult the volume itself.

The preface by the editors provides an excellent review of both the text and the state of the art (and art it still largely is). It concludes with the comment that most participants were optimistic about the further development of biological monitoring, stressing its particular value for chemicals that penetrate the skin or accumulate in the body, for assessment of past exposure, for workers not confined to a single process or position, and for those using masks. Periodic monitoring also alerts workers to health risks and can also detect poor working habits.

The introduction by Warren Cook on the complementary nature of air and biological monitoring provides a balanced view, worthy of the person who published the first list of exposure limits in 1945, authored the worldwide comparison in 1987, and is still a leader in our field today.

Although many of the readers will value the monograph for technical information on methods and interpretation, certain papers touch on papers of great social concern. It is curious that the subject appears to have been of more concern to pan-national organisations (EC, United States, Japan), than to national governmental bodies (although Japan now legally enforces the biological monitoring of workers exposed to lead and organic solvents). Is this because biological monitoring, even when not invasive (that is, by analysis of urine or breath), is a far more personal system than air sampling (even personal air sampling)? Is the accusation of using workers as “guinea-pigs” justified? What is the entitlement of the employer to intrude on personal emissions? That this is not merely a politically motivated matter was brought home to me years ago when I found it imperative to keep a worktable between myself and a ship’s cook armed with a butcher’s knife and shouting an Anglo-Saxon phrase implying “I’ll not be a guinea-pig.” Successful breath sampling finally indicated substantially higher concentrations of ethanol in his exhaled breath than of the benzene that was to be determined.

Important social and educational issues are covered in the volume, which also identifies the United States and Japanese education programmes (how many courses in biological monitoring are
available and where?). It is reported that some 30 000 abandoned hazardous waste sites have been identified in the United States; of the 225 hazardous substances selected as priority, toxicological profiles have been prepared for a half, but less than a half have validated analytical methods. If workers at waste sites are wearing respirators, what is the value of air sampling as a measure of exposure; and how, in primitive working conditions, can workers ensure complete avoidance of skin contact with hazardous chemicals?

In recent years much of the exposure assessment programme in the United States has been driven by environmental concern, and here serious questions arise on the applicability of biological monitoring; at what degree above background concentration can exposure be assessed when background itself can be highly variable, both between individual subjects and between repeated samples on a single person? As concentrations perceived by the public as “acceptable” are reduced, so biological monitoring becomes less feasible; yet how else is assessment to be made before consequences manifest themselves in ill effects? Indeed, the acceptance of a no threshold safe concentration for carcinogens must imply little future for biological monitoring in determining exposure or risk.

Today, these issues have more influence on biological monitoring programmes than the present technological shortcomings (which are many), and probably explain the promotion of supranational interest rather than activity at the level of national government.

In the application of biological monitoring we also meet professional issues. Biological monitoring of exposure, commonly by blood or urine analysis, has its origins in assisting the diagnosis of occupational disease; as such it has essentially been in the domain of the occupational physician, and interpretation of results subject to the mores of medical confidentiality. Today, developments in air sampling and its interpretation have been matched in part by those in biological monitoring; interpretation of measurements has grown from simple arithmetic methods to complex statistical procedures. Complex analytical equipment and procedures are generally required, including strict programmes for quality assurance. Biological monitoring has come to be an extension of exposure monitoring and, indeed, the ACGIH BEIs are generally set at concentrations that correspond to the threshold limit values in air.

Assessment of risk is no longer the prerogative of any one profession, but more than ever requires the contribution of members of a multiprofessional team and calls for a careful assessment of the limits of confidentiality. In 1963 I co-authored a Harwell report on urine sampling that was classified “secret”. I still wonder if the safety of the realm would really have been jeopardised by publication or whether the classification was attributable to management’s concern with proprietary information and employee relations?

We must urgently find ways of producing socially acceptable methods of broadening the information base, and increasing the application of methods that have new power in predicting risk of harm to workers. Where are our policies on action to be taken if high concentrations of a substance persist in one worker—should he or she be sacked, better protected, or the process or environment improved?

Biological monitoring must come out of the closet, its acceptability by society enhanced by education of managers, workers, and health and safety professionals, so that realistic policies on its application can be established. This will parallel the improvements in its technology, and clarify its proper role as a key part of future assessments of occupational risks. It certainly cannot do this in a work situation governed by confrontation. When and where labour relations are good it has a very important part to play in monitoring the continuing effectiveness of control measures.

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