PostScript

LETTERS

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Design of measurement strategies for workplace exposures

I write in response to the article by Hans Kromhout,[1] which sets out the case for exposure monitoring and proposes robust strategies for collecting data. He acknowledges that exposure monitoring may be expensive, but justifies it on the grounds that it is needed to ensure worker protection and data can be used for multiple purposes (hazard evaluation, control, and epidemiology). All this ignores the variety of competences and numbers of firms who use chemicals in the workplace.

We agree that good quality exposure data are extremely valuable for assessing the effectiveness of control measures, studies on health effects related to use of specific substances, and for long term epidemiological studies. Now that workers do not normally remain in one job all their working life and may be exposed to many chemicals in different industries, the lack of well validated exposure measurements is a concern. It will limit our ability in the future to carry out meaningful epidemiological studies.

In the UK we estimate that over 1.3 million firms are using chemicals. It is not realistic to suggest that all these firms should be carrying out the type of sampling regimes the article suggests. The costs would be astronomical and there is no capacity to collect, analyse, and interpret all the samples that would be generated. Recognising this and that small firms needed help to apply the risk assessment requirements of the Control of Substances Hazardous to Health (COSHH) Regulations, led HSE, in collaboration with industry and trade unions, to develop the COSHH Essentials.

COSHH Essentials is not intended to replace the collection of well validated exposure data, where that is justified; rather it is intended to help firms, particularly small and medium sized firms, to properly control the chemicals they are using. Inevitably a generic system like COSHH Essentials which groups chemicals, has to err on the side of caution, but the controls recommended by COSHH Essentials were peer reviewed by an expert group established by the British Occupational Hygiene Society and have the support of the industry and trade unions. COSHH Essentials has been used now for over three years by many firms. We have not had complaints that the controls are over precautionary. Thus we reject the implication in the article about COSHH Essentials that "ill advised control measures will arguably be even more costly in the long run, a classic case of being 'penny wise but pound foolish'".

The article misrepresents the purpose of the expert system, Estimation and Assessment of Substances Exposure (EASE). This was developed to help meet the requirement under the Dangerous Substances Directive for a risk assessment on new substances. As workplace exposure data cannot be collected on new substances prior to release to the marketplace, EASE was developed to provide an exposure estimate for use in risk assessment. It is entirely appropriate that this should be precautionary. It is not a weakness as the article implies. EASE is not intended as a tool to help employers control exposures in the workplace.

The aim of chemical control is the protection of employees' health. This is best achieved with a range of tools. EASE has a valuable contribution to make before substances are released into the marketplace; COSHH Essentials is proving to be a valuable and welcome tool for many small and medium sized firms, helping them to establish suitable controls. The recently launched electronic version will be of even greater help to many small firms. In other circumstances structured data collection is needed. These tools all have a valuable role to play. They should be viewed as complementary, not as alternatives as the article suggests.

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Reference

1 **Kromhout H**. Design of measurement strategies for workplace exposures. *Occup Environ Med* 2002;**59**:349–54.

Author's reply

I would like to reply to the comments made by Dr Michael Topping with regard to my article on measurement strategies for workplace exposures.[1] His response is focused on my introductory words on the development and promises of tools like COSHH Essentials and EASE.

His main point is that I would ignore the variety of competences and number of firms who use chemicals in the workplace and that proper evaluation (with actual measurements of workplace exposures) would come with astronomical costs and would not be possible due to lack of expertise. Together with the editor of the *Annals of Occupational Hygiene*, I question whether the introduction of tools like COSHH Essentials has contributed to the collapse of full time training of occupational hygiene professionals in Britain through lack of demand for expertise.[2] As I pointed out in my paper, measurement strategies that involve workers in the sampling procedure can be very cost efficient and have been shown to be working.[3] The claim that nobody has been complaining about controls being over precautionary after using COSHH Essentials is no justification. For instance, what if a company, after applying COSHH Essentials is advised to take expensive control measures, while actual measurements show that exposure levels are well under the occupational exposure limits? With COSHH Essentials erring on the safe side, this will likely often be the case.

The comment that I would misrepresent the purpose of the EASE expert system is false. Dr Topping forgets to mention that EASE was developed not only for new substances but also for existing substances.[4] In addition I am aware of training courses that have been given in my own country where EASE was propagated as a tool to evaluate substance exposure in workplaces. If this expert system is only to be used for risk assessment purposes, HSE should start labelling it with the phrase "not intended to be used as a tool to help employers control exposures in the workplace". However, in the documentation that came with my version of EASE we can read "Modelled data may be derived from the general purpose predictive model for exposure assessment in the workplace described in this paper and called EASE".[4]

The real problem with tools like EASE and COSHH Essentials is that they are not properly evaluated before they are launched into the occupational health arena. Peer review by an expert group established by the BOHS and support of industry and trade unions cannot replace the necessary scientific rigour of testing reproducibility and validity and having these studies peer reviewed in scientific journals. Testing validity long after introduction of a tool, as happened with EASE,[5 6] would not have been tolerated when EASE would have been, for instance, a medical diagnostic tool, or even closer to home an analytical method to measure styrene. HSE is apparently not too happy with the accuracy of EASE either, since I am informed that a project is underway to create a more valid expert assessment tool.

Even though Dr Topping justifiably suggests that the tools should be seen as complementary, the place of "structured data collection" remains unclear in his letter. One can deduce from the described use of EASE and COSHH Essentials that proper assessment of exposure by measurements would only have to take place at larger firms. Unfortunately, as we all know, that is not where the majority of workers perform their jobs. In my view, tools like EASE and COSHH Essentials should be used in the initial judgement step, and proper evaluation should always follow to prevent unnecessary investments or ill advised control measures. Given the enormous variability we have to take into account when evaluating chemical risks, we should never exclusively rely on generic tools that lack precision, and even worse, accuracy.

Finally, I would like to suggest renaming COSHH Essentials into "Where there is no expert". While staying in less developed countries, I cherished my copy of *Where there is no doctor*.[7] Nowadays, I frequent my GP who

has access to more precise and accurate diagnostic tools. To me it is unthinkable that poor man's tools are being used to evaluate chemical hazards in a well developed country such as the UK.

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1 **Kromhout H**. Design of measurement strategies for workplace exposures. *Occp Environ Med* 2002;**59**:349–54.
2 **Ogden TL**. Editorial. Occupational exposure limits: Britain tries again. *Ann Occup Hyg* 2002;**46** 435–7.
3 **Liljelind IE**, Rappaport SM, Levin JO, *et al*. Comparison of self-assessment and expert assessment of occupational exposure to chemicals. *Scand J Work Environ Health* 2001;**27**:311–17.
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6 **Aitken R**, Hughson R, Cherrie J. Validation of the EASE model in relation to dermal zinc exposures. Presented at the American Industrial Hygiene Conference and Exhibition, 2–7 June 2001, New Orleans, USA.
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BOOK REVIEWS

Aviation medicine and the airline passenger

Edited by: Cummin and Nicholson (£65.00) 2002. Edward Arnold Publishers Ltd. ISBN 0 340 80637 0 (hardback)

Books on aviation medicine and physiology tend to be written by specialists for specialists. This book is by specialists for generalists and will be of value to all doctors asked by patients for health advice prior to flying. It will also be useful, in advance it is hoped, to doctors asked to help with a patient on board a commercial flight. A distinguished group of authors has been assembled: some from the aviation medicine field and some from other relevant specialties including obstetrics, paediatrics, cardiology, and respiratory medicine. Twenty four chapters are provided: each of about 8–10 pages.

The book begins with an interesting account of the ethical and legal aspects of "Good Samaritan" activity. This is full of sensible advice: the inebriated doctor should disqualify himself from assisting in an emergency! How true. More seriously, the doctor agreeing to act should seek contractual immunity from the captain and if this is refused, the refusal should be recorded in writing. The need to keep clinical notes is obvious but could be forgotten.

A very valuable chapter on immunisation is provided. This provides much more than a schedule: details of diseases are added. The use of examples: "a 45 year old male teacher is undertaking voluntary work in Russia for 2 years" which is used as a basis for a discussion of diphtheria, is helpful.

Chamberlain has provided an authoritative account of obstetric and gynaecological incidents. To the non-practising doctor few things are likely to cause greater alarm than an emergency delivery en route. Seeking aid from a midwife is undoubtedly good advice. The value of getting advice from an obstetrician on the ground is stressed: I doubt that I would have thought of that faced with my first delivery since medical school. The advice is practical throughout and easy to follow.

I looked for a discussion of how to deal with a tension pneumothorax: assuming, probably wrongly, that I could make such a diagnosis in an aeroplane without a stethoscope and faced with an increasingly distressed patient. I was very encouraged by the advice: the inexperienced doctor may well be best advised to do nothing unless he is certain of the diagnosis. If you have to act: cannula, second intercostal space in mid-clavicular line, and a simple valve constructed from the finger of a rubber glove are the things to remember. Pain in the ear is common and well discussed, as is toothache also produced by expansion of pockets of air. In the latter discussion I could not find advice on analgesia: the doctor may be asked to suggest medication and guidance should be provided.

In conclusion, this is an outstanding book that should be widely read.

R L Maynard

Late lessons from early warnings: the Precautionary Principle 1896–2000

European Environment Agency. Editorial team chaired by Poul Harromoës. Environmental Issue Report No. 22. (Pp 212; free of charge) 2001. ISBN 92 9167 323 4. Catalogue no. TH-39-01-821-EN-C. Paper copy available from EEA online ordering service; or can obtain from: http://reports/eea.eu.int.environmental_issue_report_2001_22/en

This book, which is available free of charge, is a collection of well written accounts of cases where early warnings of impending or possible disaster were ignored. The purpose is, I think, to encourage regulators to apply the Precautionary Principle and by so doing prevent further disasters. The cases considered range from overfishing and the destruction of the Californian sardine industry (see *Cannery Row* by John Steinbeck) and the asbestos-mesothelioma disaster to MTBE as a substitute for lead in petrol and "mad cow disease". In each case the lack of attention paid to early signals is stressed. A few rather more controversial cases are included: hormones as growth promoters, PCBs, and benzene in gasoline as an environmental hazard. A great deal of useful, in some cases invaluable, information is provided.

In some of the cases it is clear that greater notice should have been taken of early warnings. In others the picture is a little less clear. For example, Professor Jim Bridges, in considering the EU decision to ban growth promoters with steroid activity, points out that the decision was taken in response to public concern and against the advice of the EU's own scientific committee and the World Health Organisation. What are we to make of this? Similarly, the evidence that exposure to ambient concentrations of benzene is damaging to health is not strong. The authors accept that their account deals only with "false negatives" and state that they failed to find good examples of "false positives". This is a very odd statement. How could examples of "false positives" be found if the requirement is to find examples of action taken that later proved to be unnecessary? How could you tell? It is at least possible that many drugs are rejected, wrongly, or at an early stage of development as a result of worrying findings in, for example, mutagenicity screening. Whether such drugs would have caused harm is unknowable.

The authors provide an interesting discussion of the Precautionary Principle. This principle has caused a great deal of debate and we seem little nearer to a clear definition of how it should be applied than we were some years ago. The principle is easy enough to grasp: act, if there is a risk of significant harm, before proof that harm will occur, if you don't act, is available. In practice the problem is more difficult. Should all organophosphorus compounds be banned? There is undoubted evidence that exposure to some organophosphorus compounds at high doses produces damage to the nervous system and it is conceivable that low doses also do so—or at least in some individuals. So why wait? The answer is that insecticides are important in the maintenance of public health and the production of food. The same could be said of nitrate fertilisers. What is needed is a calculus or method that allows the strength of the evidence that exposure to environmental and well controlled occupational concentrations of toxic materials causes harm to be judged. The authors do not propose such a method. Nor do the authors address the difficult problem of cost-benefit analysis. Sometimes this can be ignored: these are the easy cases. If safer alternatives, that do not add significantly to costs exist, then the decision is straightforward. In more difficult cases such alternatives do not exist and are not likely to be developed until a ban or partial ban on the primary compound or product has been enacted. Additionally, the authors do not consider how to decide how large an adverse impact may be acceptable. How to equate costs and benefits remains a difficult issue: valuing health is repugnant to many and yet, deciding on how much to spend without some means of valuation, becomes very difficult indeed. The authors do not take us far in this area, though an analysis of the costs and benefits of using DDT to control mosquitoes might have been instructive.

A particularly interesting section of the report deals with the alleged dislocation between policy institutions and the public. The authors are sharply critical of what they assert are common responses by policy makers—in particular the tendency to call for more data and what the authors describe as the policy maker's attitude to what they (the policy makers) conceive as the public's desire for certainty and zero risk. The authors deplore the attitude of some which suggests that the Precautionary Principle is "pandering to populist and anti-science sentiment". The authors, rightly in my view, stress that policy making cannot be based on "facts" alone but should include "values". Unfortunately, reaching a consensus on values is not at all

easy and, though practices such as stakeholder involvement help, judging the public's attitude to risk is difficult. We are all "unscientific" in our attitudes to risk—at least I find myself inconsistent about personal risks. Engaging the public in policy making is the challenge of risk management in all countries.

In conclusion then, this is a useful book that provides much for regulatory toxicologists to ponder on. It is clear that the authors feel that regulators often get things wrong: unfortunately, we have no way of knowing how often they "get things right".

R L Maynard

History of aerosol science

Edited by Othmar Preining and E James Davis (pp 438; 49.42 Euro) 2000. Vienna: Verlag der Österreichischen Akademie der Wissenschaften. ISBN 3-7001-2915-7

The *History of aerosol science* is a symposium volume that provides a written record of the First Symposium on the History of Aerosol Science, held from 31 August to 2 September, 1999 in Vienna, Austria. The symposium was held in the sumptuous surroundings of the Theatersaal of the Austrian Academy of Sciences. The high cultural standing of the event can be judged from the front cover of the book, which carries a reproduction of La Grande Famille by Rene Magritte, and the Appendix which contains the musical score of *Haze, Fume and Spray* by Meinhard Rudenhauer. This was an original work composed for the opening of the symposium.

The symposium volume contains a prologue by Othmar Preining of the Clean Air Commission of the Austrian Academy of Sciences, and three sections reflecting different aspects of the history of aerosol science. The first section, comprising 11 chapters, covers the historical development of aerosol science. The second section contains biographies of 12 individual scientists who exerted a major impact on the development of the subject. The third section examines the role played by 16 national and international aerosol organisations and their journals. The text finishes with an epilogue by Othmar Preining. Indices are provided for subjects, proper names, and author addresses.

The historical section opens with two fascinating chapters, the first on aerosols in art by Peter Brimblecombe and the second on aerosol science up to the year 1900 by Rudolf Husar. Chapters then follow in quick succession providing biographies of Michael Faraday, John Tyndall, John Aitken, Ludwig Lorenz, Gustav Mie and Peter Debye, Robert Brown, Ehrenhaft, Georgius Agricola, William Gilbert, James Clerk Maxwell, Ludwig Boltzmann, Lord Rayleigh, Norman Davies, Jean Bricard, Ted Rich, Ken Whitby, Bernard Vonnegut, Isiah Gallily, and Alexei Sheludko. The biographies are authoritative and well referenced but give no appreciation of the scientific advances made because they focus on the personalities and not the technical developments. Despite the importance given to the contribution made to aerosol science by Nocolai Fuchs, no biography is presented, despite being indexed in more chapters than any other aerosol scientist. A strange omission for someone credited with being the father of aerosol science.

There is some valuable review material here, particularly on the ambient aerosol studies in California and the health aspects of ambient aerosols in the USA. Regrettably, the global climate impacts of aerosols get no significant treatment in this historical presentation. The national summaries could have provided much more review material, describing what has been learnt in the different countries about aerosol science. This would have made the book a much more useful volume.

The book is riven with contradictions. The preponderance of new results burying old theories must be balanced against the new discoveries that can only be made with the latest state of the art instrumentation. The balance between personal science and team science is discussed in many places. The difficulties of accommodating independent characters in directed research teams and the bureaucracy associated with government and other research organisations are highlighted. The successes of directed research programmes, apart from those in California, are not addressed. The text plays down the importance of directed research into chemical warfare, nuclear power, and other commercial areas, and emphasises the role of pure aerosol research by individual scientists. It is not clear whether the editors feel that this "small science" model is valid for aerosol science in the future.

This is a specialist book aimed at those interested in the motivation, idiosyncrasies, and background of some of the most influential scientists that have contributed to the development of aerosol science. It will have its greatest appeal as a symposium volume and as an aide memoir to those involved. It will not be of much interest to students and researchers, except perhaps to those deeply involved in pure aerosol science research.

R G Derwent

NOTICES

27th International Congress on Occupational Health: The Challenge of Equity in Safety and Health at Work, Iguassu Falls, Brazil, 23–28 February 2003

The Congress will have about nine keynote conferences, approaching different angles of the Central Theme; those themes will then be discussed in depth by Panels (60), where different opinions will be debated. There will be about 60 mini-symposia organised by the ICOH Scientific Committees and Work Groups; facilities for the presentation of 1000 posters; and about 500 free papers. Interest groups may schedule meetings in Congress areas.

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First World Congress on Work-Related and Environmental Allergy (1st WOREAL), and Fourth International Symposium on Irritant Contact Dermatitis (ICD), Helsinki, Finland, 9–12 July 2003

Congress on Work-Related and Environmental Allergy

- Work related and environmental aspects of respiratory and skin allergy
- Specific issues related to pathophysiology and skin allergy
- Management and prevention of allergy

Irritant Contact Dermatitis Symposium

- Occupational irritant dermatitis
- Prevention of irritant dermatitis
- Alternative methods for the assessment of irritants
- Irritant dermatitis from cosmetics

Satellite events

- Satellite Symposia, 9 July 2003
- Allergy School, 9–10 July 2003
- 7th International NIVA Course on Work-Related Respiratory Hypersensitivity, 11–15 July 2003

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